COMPUTING FOR BUSINESS AND HOME

INTERFACE AGE™

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Selecting Payables/Receivables Software

MICRO IDIOMS: A Look at 3 Language Options

New Products Directory

Thinking Multiprocessing?

Think Teletek's SBC-1

Teletek's SBC-1 provides each user in a multi-processing system with his own CPU, serial ports, parallel ports, CTC, 128k of segmented memory with (optional) "RAM drive." The **SBC-1** is the most powerful S-100 slave processor available today.

- System may run at 4MHz with **SBC-1** running at 6MHz
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- optional "RAM drive" capability allows extremely fast operation
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- 1k or 2k FIFO allows efficient communication to the bus master
- Two parallel ports — may be converted to an RS422 port or another RS232 port using Teletek's PSC board
- Three levels of reset are possible
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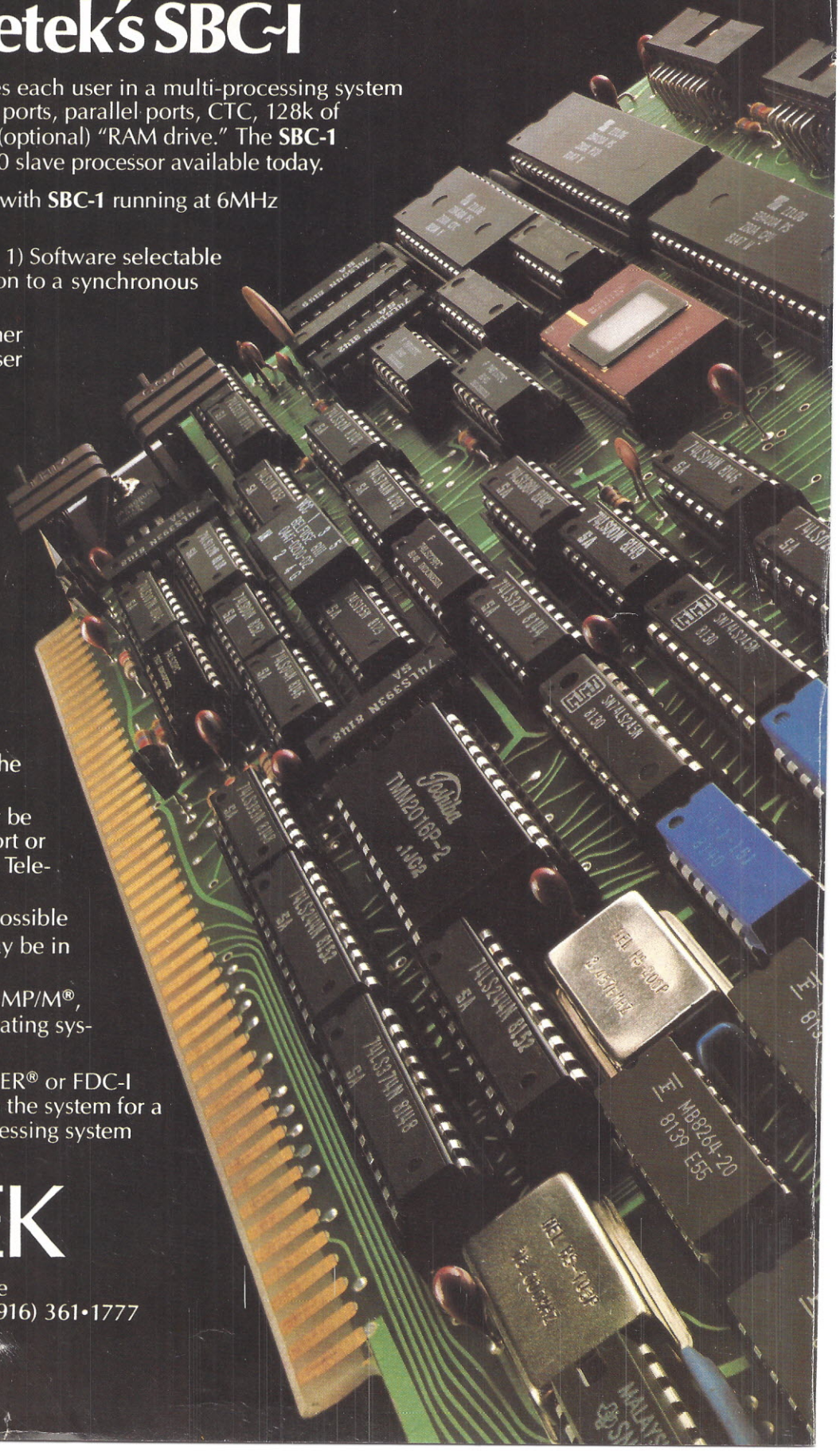
- Digital Research (CP/M®, MP/M®, CP/NET®) or Infosoft operating systems available

Use Teletek's SYSTEMASTER® or FDC-I as the master processor in the system for a state-of-the-art multi-processing system that begs comparison!



TELETEK

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CIRCLE INQUIRY NO. 75

New Cromemco System One shown with our high-capability terminal and printer.

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- **64K of RAM**
- **780K of disk storage**
- **CRT and printer interfaces**
- **Eight S-100 card slots, allowing expansion with**
  - **— color graphics**
  - **— additional memory**
  - **— additional interfaces for telecommunications, data acquisition, etc.**
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This small computer even gives you the option of outstanding high-resolution color graphics with our Model SDI interface and two-port RAM cards.

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ANTI-OBSOLESCENCE/LOW-PRICED

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What's more, it's priced at only $3,995. That's considerably less than many machines with much less capability. And it's not that much more than many machines that have little or nothing in the way of expandability.

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Get all the details on this important building-block computer. Get in touch with your Cromemco rep now. He'll show you how the new System One can grow with your task.

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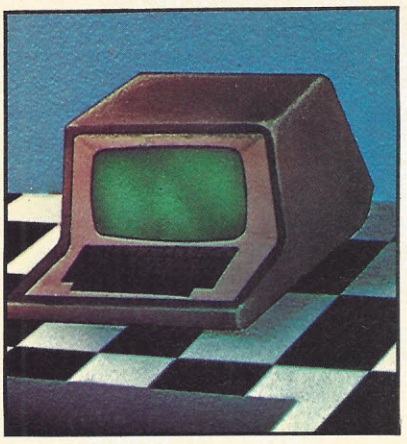
JUNE 1982

INTERFACE AGE™

COMPUTING FOR BUSINESS AND HOME APPLICATIONS



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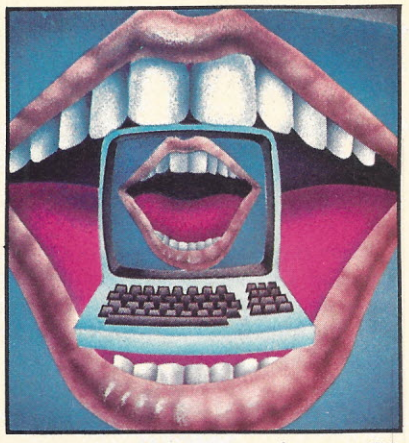

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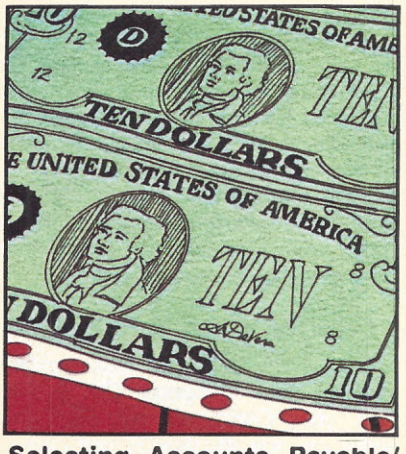

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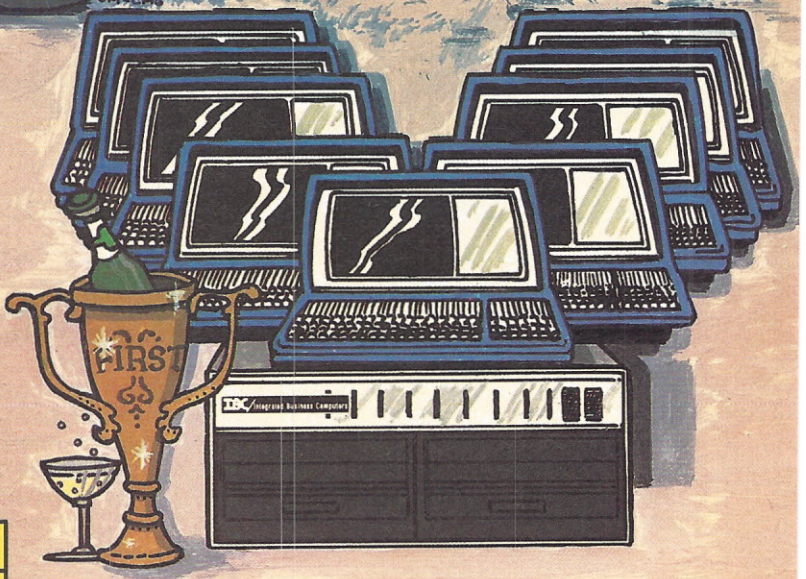

CIRCLE INQUIRY NO. 46

	IBC	onyx	ALTOS
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CPU Speed (MHz)	6	4	4
Disk Speed I/O (MB/Sec.)	.81	.65	.54
Seek (Milli Sec.)	35	50	65
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Birth of a legend.

Epson.

A whole new generation of Epson MX printers has just arrived. And while they share the family traits that made Epson famous — like unequalled reliability and ultra-fine printing — they've got a lot more of what it takes to be a legend.

For instance, they've got a few extra type styles. Sixty-six, to be exact, including italics, a handy subscript and superscript for scientific notation, and enough international symbols to print most Western languages.

What's more, on the new-generation MX-80, MX-80 F/T and MX-100, you get GRAFTRAX-Plus dot addressable graphics. Standard. So now you can have precision to rival plotters in a reliable Epson printer. Not to mention true backspace, software printer reset, and programmable form length, horizontal tab and right margin.

All in all, they've got the features that make them destined for stardom. But the best part is that beneath this software bonanza beats the

EDITOR'S NOTEBOOK

Are standards worthwhile?

The subject of standards always seems to create controversy. Many consumer support groups are advocating standards to allow most products to interface to the maximum number of other products—this includes hardware and software. Many designers and manufacturers, on the other hand, want the flexibility to create newer and better products. But the discussion should deal more with how an item is designated a standard—not what the standard should be.

Consider programming languages. Many of the well-known languages have been formalized and standardized—a number of times. Fortran, Basic, Pascal and (more recently) Ada have all had standards written, proposed and possibly adopted. That should make programs written in these languages transportable from one computer system to another. That would be nice. But how many times have you been able to do this?

We've had several people ask, "Why doesn't every semi-conductor manufacturer use the same assembly language?" They want to use their existing programs on more modern, more sophisticated and higher performance processors. But it's only natural to assume that a more advanced device would require new instructions to take advantage of the new features. Consequently, there will be changes in the assembly language. It's particularly difficult to use the same set of assembly mnemonics for different microprocessors that accomplish things differently. Prolog has made an attempt at it, but few people use those mnemonics and we doubt that any assembler exists that translates them to any machine code. Even so, if a standard assembly language were created, someone would bastardize it to suit his purpose.

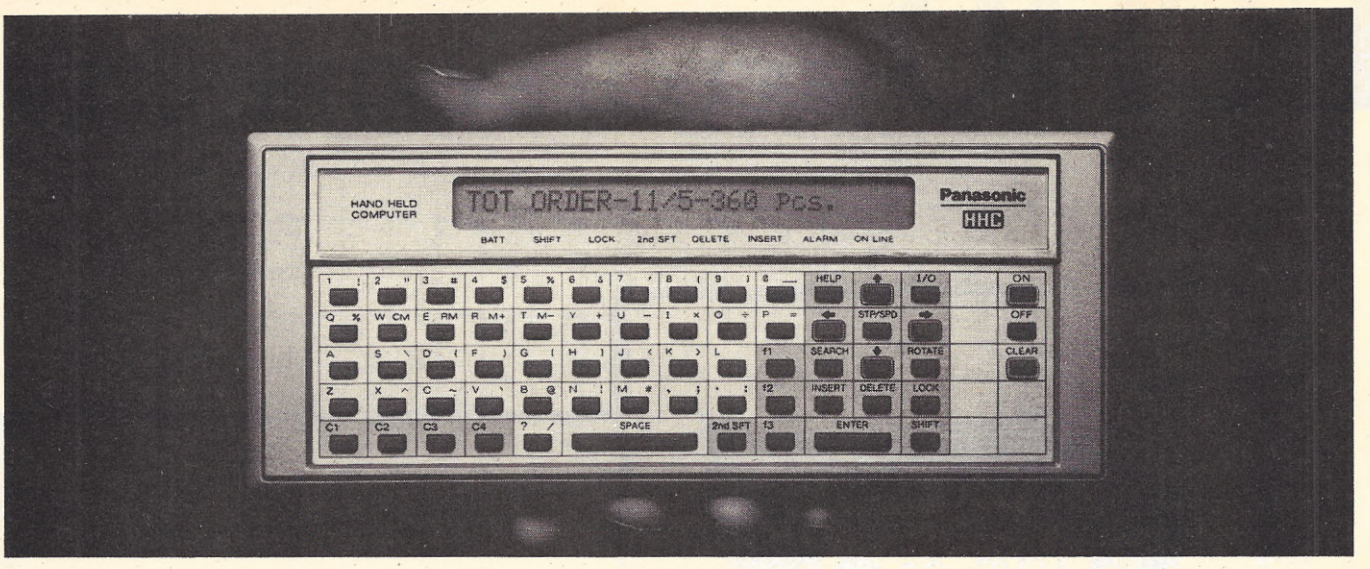
Higher level languages have fared much better in this standardization battle, but problems still exist. One microcomputer manufacturer provides a Fortran compiler that "Meets ANS Fortran 77 Subset Language Specification," but it also specifies that special extensions are added. Is this now meeting the standard? Another popular business language, Cobol, is described as meeting and exceeding "minimum ANSI Level 1 Standard for Cobol (X3.23-1974)". If it truly *meets* the standard, I'd consider it compatible. But if it *exceeds* the standard, can it be considered compatible? Maybe it's upward-compatible but not necessarily downward-compatible.

The point is, just because someone claims compatibility with a standard doesn't mean a program will operate equally well on different systems. I think improvements and modifications to existing software standards are often welcomed and seldom rejected. If everyone had standardized on Fortran 15 years ago (Fortran-66), would there have been a need for Fortran-77? Or would we have the opportunity to use more powerful languages such as Pascal and the soon-to-be standard Ada?

Operating systems fall into the same one-upmanship category. Some claim CP/M is a standard, others claim it's not even an operating system. In any case, it is the *de facto* standard operating system in the personal computer arena. But CP/M has not been designated a standard by any group, and it has not been adopted by any software committee. CP/M is perhaps one of the best examples of a non-standard being accepted by the maximum number of users. Watch what happens as the multiuser operating systems develop. MP/M, OASIS, and UNIX are major contenders for the welterweight champions in terms of multiusers. Even if one wins out over another—and that's unlikely as things stand now—someone, somewhere, will come along and improve it. CP/M just happened to be in the right place at the right time (first) and hundreds of application programs that operate under CP/M are available—MP/M is likely to come out a winner for the same reason.

Many hardware standards have been adopted for the microcomputer industry, some merely by default, others only after a great deal of effort. It seems that the effort that has gone into creating standards is seldom justified, at least for economic purposes, in the end product. Consider Intel's Multibus which, although superior in terms of capacity and performance, is not used in small business computers due to the inherent cost of the typically larger boards. The other well-known bus standard is the S-100 bus, which was conceived and nurtured by the personal computer business. Even with this approved standard hardware interface, products using the S-100 bus tend to be more expensive than those custom-designed for a particular application.

Companies like Radio Shack and Apple, with two of the most popular personal computer systems, have each created an internal hardware bus along with unique software operating systems. Evidently the consumer is not concerned with standards but is concerned with low price. I don't believe that standardizing internal busses can help to create low price in personal computers, but



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The Link.

It's the next major business tool because it's a full-logic computer that's fully portable.

Exchange information with other computers with the telephone modem.

By itself, it can perform a wide variety of sophisticated computer functions because it can store 4K bytes of information. Equally important, it can link you to the information and brainpower of your main office computer—wherever you go. You can program in Microsoft Basic.® Yet it's easy to operate, even if you've never worked with a computer before.

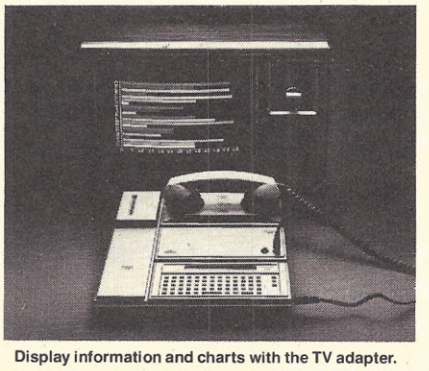
Imagine. Using just The Link, anyone in the field, the plant or on the sales floor—like salesmen, managers, engineers or retailers—can now answer questions that used to mean a trip back to the office. A sales engineer, for example, types data into The Link and gets detailed product information and specs on the spot.

And The Link is part of an entire computer system: By adding different optional components, you can create whatever kind of computer you need. Wherever you need it.

By adding the telephone modem, for example, a salesman can put his company's main office computer or a data bank to work for him from any telephone booth. He can check credit ratings and inventory, trace shipments, enter orders, make bids and estimates, and much more. So The Link can make him and his office computer much more productive.

By adding the microprinter, the salesman gets hard copies of information right on the spot—an instant record of his transactions.

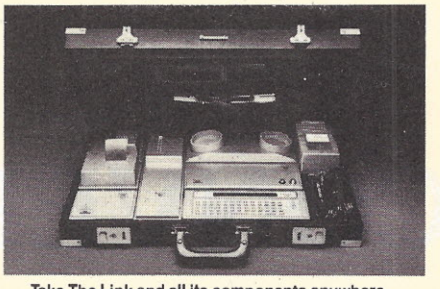
By adding the TV adapter, he can display information and 8-color charts on any color TV screen. So he can use data from his office computer to develop a sales presentation in a motel room. And show it on a client's video monitor the next day.



Display information and charts with the TV adapter.

If the salesman needs to work with a bigger program and more memory, other optional components increase The Link's capacity to 52K RAM plus 64K ROM. That's more than many desktop computers.

The Link measures only 9″ x 4″, weighs only 21 ounces,



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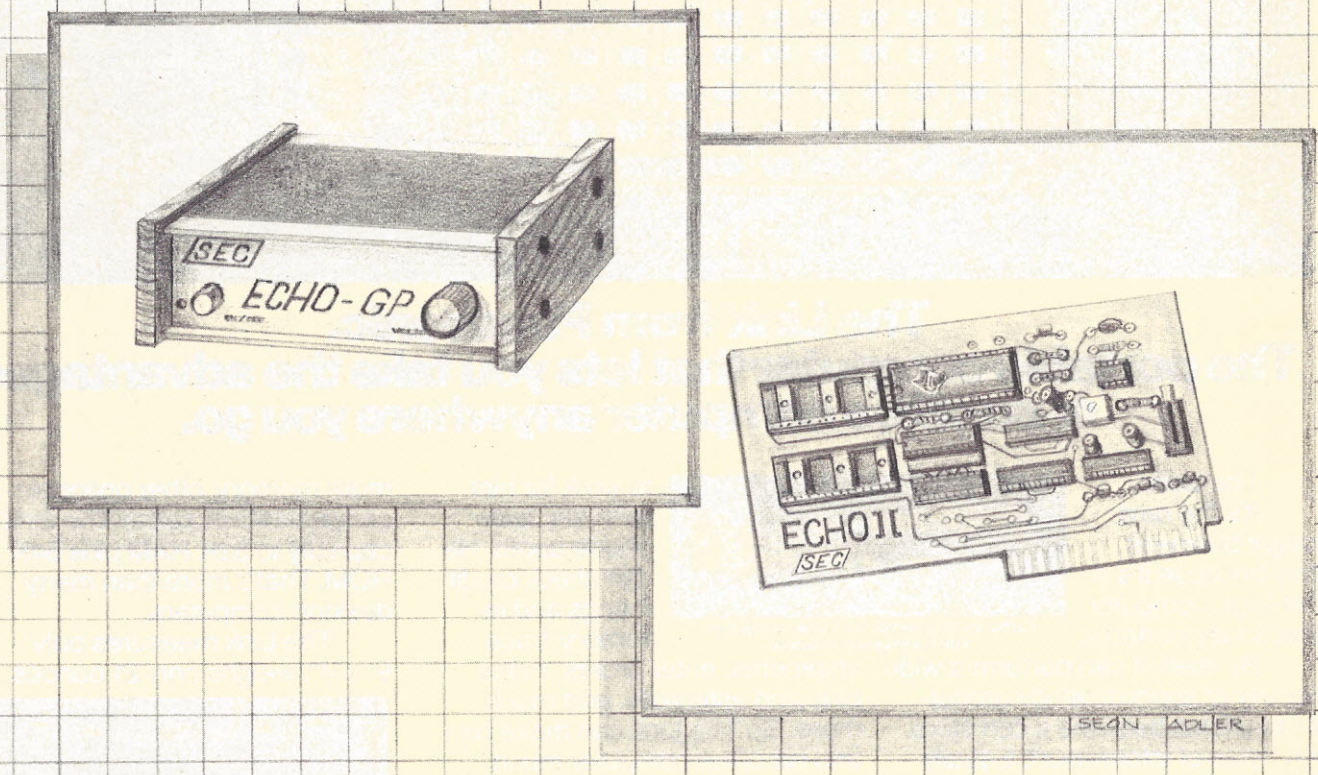

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CIRCLE INQUIRY NO. 72

EDITOR'S NOTEBOOK

the diversification of hardware designs can certainly promote innovations and consequent lower cost.

The undisputed leader in the computer industry, IBM, has not conformed to any standard for its personal computers. In fact, products from different IBM divisions frequently have trouble communicating with each other. Even though IBM has chosen a popular—not *standard*—microprocessor (Intel's 8088) and the de facto standard operating system (CP/M 86), the company did not in any way try to standardize its internal bus.

IBM has not even provided the usual system components, meaning the consumer will have to depend on outside source for items such as Winchester drives and application software. The IBM personal computer should not be considered a standard—at least not yet. Many of IBM's past products have become known as standards but not by committee—merely by sheer volume.

Those companies inundating the market with an important product don't really create a true standard; they merely create an environment for entrepreneurs and technical innovators to produce expansion capabilities for an individual system. Standards typically take too long to be created, approved and adopted for the burgeoning personal computer market to stand by and wait for a standard—be it hardware or software.

Let's consider some of the problems that have occurred with so-called standards. An item is finally adopted as an official standard after months or even years of discussions. Then some computer whiz thinks he can make it just a little better by adding a feature or two. Meanwhile, another equally clever person is doing the same thing—only a different way. Both of the products are claimed to be compatible with—or maybe better than—the standard. But even though compatible, there really is not a standard anymore! You can present this scenario for a number of hardware and software products.

There are some engineers who would like to improve the performance of their microcomputer systems by pulling out present microprocessors and simply plugging in higher speed, higher performance devices. (This is possible for devices in the same family.) There are others that would be content with pulling out a board and plugging in a higher performance board. (This is quite popular but the software usually disagrees with the idea.) On the peripheral side, we fortunately have some standard interfaces that allow use of several manufacturers' equipment for both parallel printer interfaces and serial terminal interfaces.

Even the leading computer manufacturer has not conformed to any standard

Now we get to the hard part: attempting to standardize disk drives. Most of the single density 8-in. drives allow an interchange of media between systems and even some of the 5 1/4-in. disks can be written on one type of computer system and read on another. But this is not true for every case. Actually, the promoters of disk standardization are more interested in hardware interface than in media interchange. Some of the standards supporters would like to see the computer, the associated peripherals and the software interface with each other as conveniently as the products found in a stereo components store. The argument is that since you have such a wide choice of audio equipment, the consumer can obtain the products at a much more favorable price.

The question is not merely whether products can interface with a particular microcomputer system but whether they can interface with *all* microcomputer systems. This standard interface is to be provided not only through the tangle of wire strung across a cluttered desktop, but also through the myriad of useful programs available on the market today. Many software products are well-accepted for operation on one brand of computer, but in order to operate on another popular unit they will have to be modified by the author to accommodate the limitations or enhancements of other computer systems.

Many of the concepts used in developing new microcomputer products have attained notoriety primarily because a designer or innovator tried to improve an existing design and did come up with something better. Languages such as Fortran, Basic and Pascal have all had standards written, proposed and accepted, but all of these have been "improved" by industrious programmers.

It is fortunate, however, that there are some standards in this industry. The RS-232 interface is a good example. But

even this stalwart of the computer industry is not necessarily fully implemented according to this standard by all manufacturers. In fact, few manufacturers understand the true meaning of the RS-232 intentions and most can claim only limited compatibility. Yet we still have hundreds of peripheral devices that adequately interface with the RS-232 ports.

While we agree in principle with some of the concepts of standardizing, we don't believe that any standard should be forced on either suppliers or consumers. In many cases, standards just don't benefit the consumer. A standard could be available, but optional, for manufacturers interested in adopting that standard. If it proves to be cost-effective, it may even be accepted by the public. In any case, innovation should not be discouraged by standards. And it is unlikely that every consumer would be willing to have the identical system anyway. Some people just like to be different. Our country was built on the concepts of freedom of choice, and imposing standards removes one of the basic rights of human development.

—TB

New breed of software

During this year's West Coast Computer Faire (San Francisco, CA), the single most frequently-heard topic had to do with innovations in user-friendly software. Manufacturers are apparently awakening to the fact that the new breed of computer users want to simply turn the machine on and let it go—they aren't interested in complicated manuals, lengthy documentation or struggling with the peculiarities of various languages and machines. The computer user in the post-hobbyist era simply wants to plug in his machine and quickly get the program up and running.

Particularly vocal in their feelings on this matter were Martin Dean and Zev Rattlet, President and Vice-President respectively, of Select Information Systems (Kentfield, CA). The company's Select word processing system (see review in next month's issue) is self-teaching, English-speaking and capable of being learned in 90 minutes, according to Dean and Ratlett. Carrying the user-friendly theme a step further, the company introduced its newest product at the Faire. The Teach/M program is designed solely to teach the user how to work with the CP/M operating system (Digital Research, Pacific Grove, CA) with minimal effort.

In a similar vein, Taurus Software (San Francisco, CA) introduced CP+, an enhancement that replaces the CP/M command structure with a series of English language menus, messages and directions designed for beginners. It also allows CP/M to perform multiple simultaneous functions.

Yet another user-friendly product is Personal/Pearl by Relational Systems (Salem, OR). This program-generation software, also interacting with the user in simple English, requires only a 56K-byte RAM unit operating under CP/M. Thus a wide range of users with various types of equipment have easy access to custom programming.

The result of this new trend—*extra* user-friendly software—will undoubtedly be a healthy upturn in the number of users drawn to the computer mystique. As the convenience of using computer equipment becomes more obvious, more businesspeople, educators and users of all types are bound to hop on the bandwagon. ***—LS***

IS THIS LEVEL OF RELIABILITY REALLY NECESSARY?

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If you've ever lost data due to a faulty disk, you know how important reliability can be.

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Dealers: Give your customers a choice—Accutrack's OEM performance as well as your heavily advertised brand. We have the industry's only complete line of disks, cassettes and mag cards, including virtually all special formats. If you want a quality line, small minimums, the ability to mix and match, private labeling, fast delivery and great price, call today. Find out how responsive a media supplier can be.

TO BECOME THE LEADER IN TERMINALS, TELEVIDEO HAD TO GIVE YOU MORE.

WE'RE STILL GIVING YOU MORE WITH OUR NEW SMALL BUSINESS COMPUTERS.

The new TS 802 business computer.

In three short years, TeleVideo became the number one independent supplier of CRT terminals in a very competitive marketplace.

We did it by designing and building terminals with more performance, reliability, features and functions than the competition.

But at a lower price.

Now TeleVideo has entered the even more competitive microcomputer marketplace. And we intend to repeat that success with the same basic philosophy:

By providing big system performance and features. And TeleSolutions—a hardware/software package that includes word processing and financial planning software programs.

For a price lower than many of the low performance personal computers.

TELEVIDEO'S TS 802 AND TS 802H. THE COMPUTERS THAT GIVE YOU MORE.

The TS 802 is TeleVideo's lowest priced computer.

Yet it gives you many more of the important features found only in larger computers costing much more.

- Like modular design for easier maintenance.
- High speed Z80A microprocessor with 64K bytes of RAM main memory—enough memory to handle most business applications.
- The CP/M operating system, which is included at no additional cost to give you access to more microcomputer software programs than any other operating system.
- An upward growth path through a unique multiple processor, building block architecture.
- Dual 5¼ inch double density diskettes with a million bytes of unformatted storage capacity.
- A high resolution, non-glare video screen with detached keyboard—just two examples of our innovative, ergonomic computer design.
- Two R232C serial ports for a printer *and* modem.
- And a high speed port for plug-in expansion to a larger multi-user, multi-tasking TeleVideo computer system.

But suppose you need more storage. TeleVideo's next model up, the TS 802H, gives you all the same features of the TS 802. But instead of two floppy diskettes, it uses one floppy diskette and a 5¼ inch Winchester hard disk to give you 10 million bytes of unformatted storage capacity—10 times the storage for only twice the price of the TS 802.

COMPUTERS THAT GROW AS YOUR NEEDS GROW.

The TS 802 and TS 802H are more than just single-user, stand alone computers.

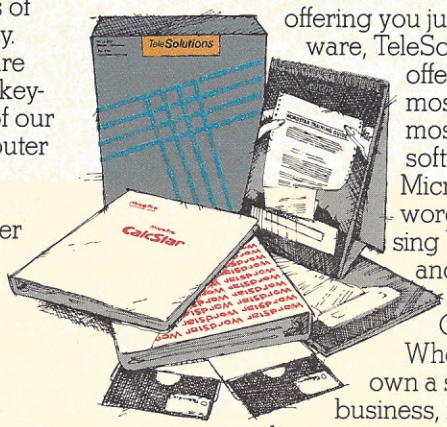
When it's time to expand, simply plug them into TeleVideo's more powerful TS 806 or TS 816 multi-user, multi-tasking systems. The TS 802s then become intelligent, fast response satellite stations.

And because each has its own CPU, there's none of the degradation of throughput and contention for a single CPU that slows down the typical shared system. Each user maintains full processing capability in a shared file environment.

With TeleVideo, there's no obsolescence. Because of the unique multi-CPU architecture and TeleVideo's multi-tasking software, the TS 802s do not have to be replaced as your data processing needs grow.

TELESOLUTIONS.™ THE SOFTWARE PACKAGE THAT GIVES YOU MORE.

Instead of offering you just a business microcomputer, TeleVideo is offering a computer and software package called TeleSolutions. And instead of offering you just any software, TeleSolutions offers you the most popular, most versatile software: MicroPro's® word processing WordStar™ and business planning CalcStar.™



Whether you own a small business, manage a department in a company, or are your organization's DP manager, the combination of TeleVideo computers with WordStar and CalcStar gives you the quality text editing and financial planning help you'll need. If you do require more software, our CP/M operating system allows you to choose from the widest variety of microprocessor software.

When you buy either the TS 802 at $3,495* or TS 802H at $6,995,* TeleVideo includes WordStar and CalcStar for a special price of $500—a savings of nearly $300.

WORLDWIDE SERVICE.

TeleVideo's small business computers are serviced by a professional nationwide service network, and distributors in the U.S. and in 27 countries abroad.

THE BETTER BUSINESS SOLUTION? PROVE IT TO YOURSELF.

Before you begin evaluating business computers make a list of what you'd like one to do for you. Then bring that list to one of TeleVideo's computer dealers throughout the world. Sit down at a TeleVideo® computer. Study the TeleSolutions Package. Even try another computer. Compare the features, the functions, and the performance.

And compare the price.

We don't think you'll find a better business solution than TeleVideo and TeleSolutions.

For more information call toll free 800-538-1780.

TeleVideo®

TeleVideo Systems, Inc.
Dept. #618A
1170 Morse Avenue
Sunnyvale, CA 94086

Please send details on TeleVideo computers and TeleSolutions to:

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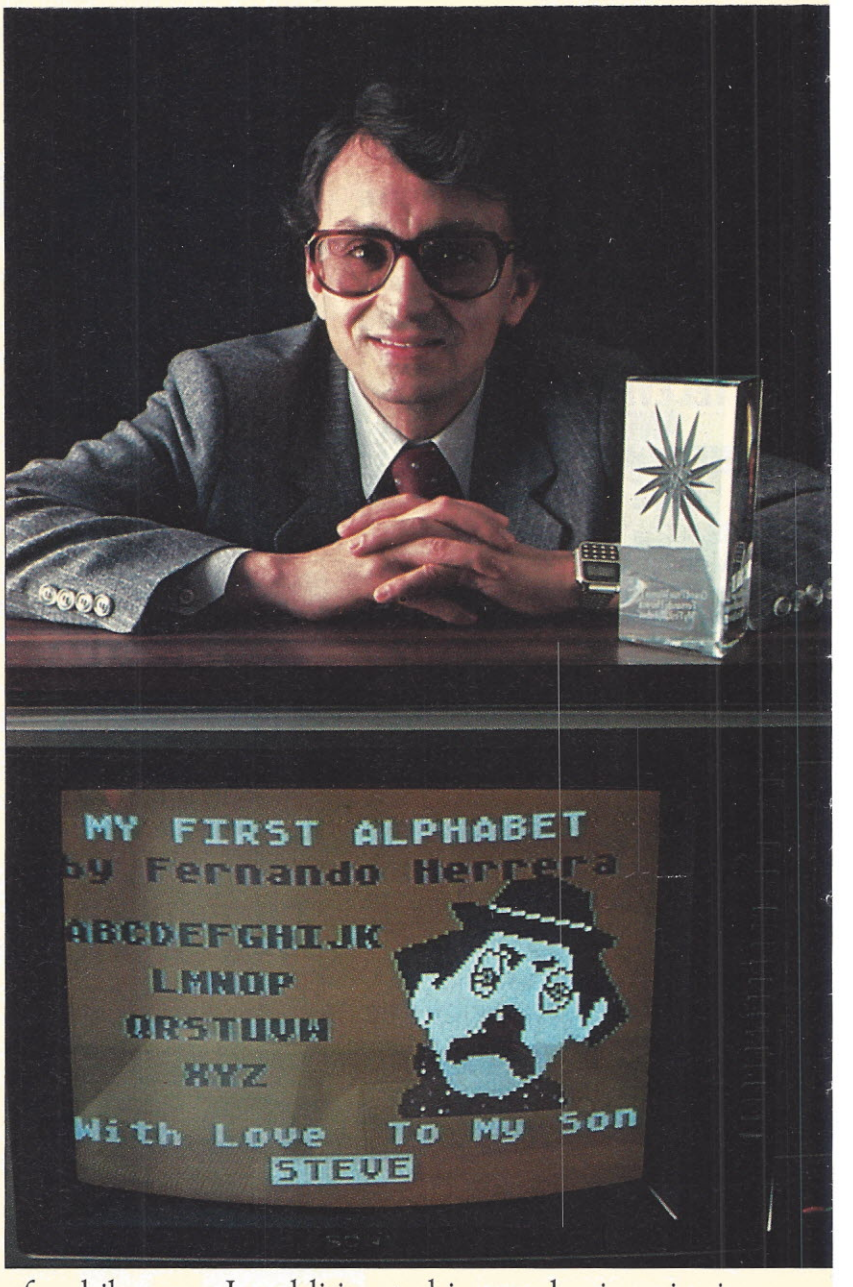
TeleSolutions™ is a trademark of TeleVideo Systems, Inc. WordStar™ and CalcStar™ are trademarks of MicroPro International Corporation.
CP/M is a registered trademark of Digital Research Inc.
*Prices are suggested retail excluding applicable state and local taxes—Continental U.S.A., Alaska and Hawaii.

Northeast Region 617/369-9370; Eastern Region 212/308-0705; Southeast Region 404/447-1231; Midwest Region 312/969-0112; South Central Region 214/258-6776; Northwest Region 408/745-7760; Southwest Region 714/978-6038; European Sales (Holland) 31-075-28-7461

CIRCLE INQUIRY NO. 76

AN ATARI 800™ HOME COMPUTER AND A FATHER'S LOVE COMBINED TO HELP CHILDREN EVERYWHERE.



Fernando Herrera became the first grand prize winner of the ATARI Software Acquisition Program (ASAP) competition because he believed in computers, his son and himself.

The story of Herrera's success began with his son's sight problems. Young Steve Herrera had been born with severe cataracts in both eyes and, naturally, his father was concerned. Herrera reasoned that the boy's learning abilities could be seriously affected by growing up in a world he could not see.

Having just purchased an ATARI 800 Home Computer, it occured to Herrera that this could be the perfect tool for testing Steve's vision. So he wrote a program simply displaying the letter "E" in various sizes.

Success! It turned out that 2-year-old Steve could see even the smaller "E's" without special lenses. Herrera was first relieved, and then intrigued when he discovered that not only could his son see the "E's," but he would happily play with the computer-generated letters for hours. So Herrera added a picture of an elephant to go with the "E," and then more letters and pictures. Thus, "My First Alphabet" was born, a unique teaching program for children two-years and older consisting of 36 high resolution pictures of letters and numbers.

Herrera submitted the program to the ATARI Program Exchange, where it became an instant best-seller. ATARI was so impressed with the outstanding design, suitability and graphic appeal of "My First Alphabet," that the program is being incorporated into the ATARI line of software.

In addition to his grand prize winnings of $25,000 in cash and an ATARI STAR trophy, Herrera also automatically receives royalties from sales of his program through the ATARI Program Exchange.

But Fernando Herrera wasn't the only software "star" that ATARI discovered. Three other ATARI STARS were awarded at the ASAP awards ceremony for software submitted to the ATARI Program Exchange and

judged by ATARI to be particularly unique and outstanding.

Ron and Lynn Marcuse of Freehold, New Jersey, teamed up to write three winning entries in the Business and Professional category for home computers: "Data Management System," "The Diskette Librarian" and "The Weekly Planner."

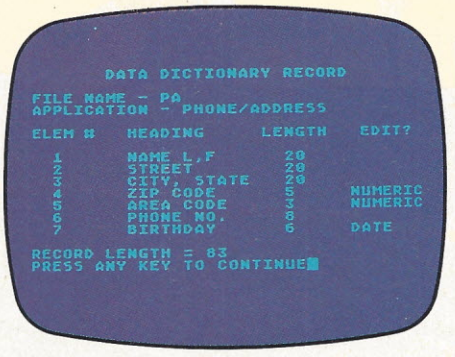
Sheldon Leeman of Oak Park, Michigan, captured an ATARI STAR for his exceptionally well-engineered "INSTEDIT" character set editor.

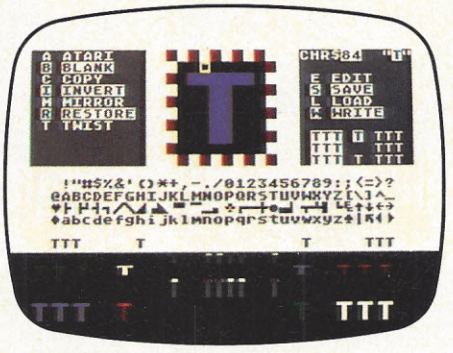
Greg Christensen of Anaheim, California, became our youngest ATARI STAR winner at the age of 17. Christensen designed the clever "Caverns of Mars" game program, which also will be incorporated into the ATARI product line. Greg designed the program in 1½ months after owning his ATARI Home Computer for less than a year.

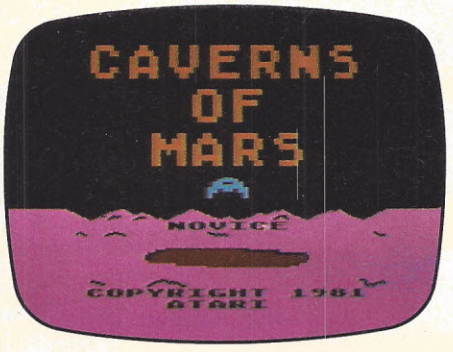
Every three months, ATARI awards ATARI STARS to the writers of software programs submitted to the ATARI Software Acquisition Program and judged first, second and third place in the following categories: Consumer (including entertainment, personal interest and development); Education; Business and Professional programs for the home (personal finance and record keeping); and System Software.

Quarterly prizes consist of selected ATARI products worth up to $3,000, as well as an ATARI STAR, plus royalties from program sales through the ATARI Program Exchange. The annual grand prize is the coveted ATARI STAR trophy and $25,000 in cash.

To be eligible, your software idea must be accepted by the ATARI Software Acquisition Program. Your program can have a broad application or serve a very specific purpose.







After submittal, consultation from ATARI is available if you need personal assistance with sound, graphics, or other technical aspects of your program.

To make your job easier, ATARI provides some 20 software development tools through the ATARI Program Exchange. A list and description of the various system software is published quarterly in the ATARI Program Exchange Catalog. These tools enable you to utilize all the ATARI resources and software, including the six ATARI programming languages.

Fernando Herrera had a great idea that made him a star. ATARI would like to give you the same opportunity.

ATARI®
A Warner Communications Company

Enter the ATARI ASAP competition and you could win $25,000 in cash, royalties, some great prizes and an ATARI STAR.

SUBMIT TO: ATARI® Software Acquisition Program
Dept. C22R, P.O. Box 427
155 Moffett Park Dr., B-1
Sunnyvale, CA 94086

OR CALL: 800-538-1862; in California, 800-672-1850.

I'm reaching for the stars. Please send me an entry form today.

Name_____

Address_____

City_____

State/Zip_____

ATARI HOME COMPUTERS

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WE'RE STILL

STANDARD

● 64K internal memory. ● Up to 1.5 Megabytes of dual disk storage – easily expandable to 10 Megabytes. ● Twin RS-232 serial ports. ● A CP/M† disk operating system. ● Two 4 MHZ Z80A Processors for faster response. ● A Full 80 x 24 line display on a 12-inch non-glare screen. ● Optional graphics capability.

SUPERBRAIN™

It used to be that buying a microcomputer was a simple task. There were only two or three manufacturers offering them and comparing prices and specifications was easy to do. Today, Intertec is no longer one of a handful of microcomputer vendors trying to attract your attention, but. . . we think we're still the best. And for a good reason.

Consider pricing. Our customers tell us we're still the price/performance leader in single-user *and* multi-user microcomputer systems. Ask around. Most folks (and even some manufacturers) will concede that point. What a lot of people do not know is that Intertec may very well offer the best customer protection programs in the industry. What is customer protection? It's a totally new, comprehensive product and customer support program which virtually guarantees your long term satisfaction with every new Intertec product you buy. It means that if you are not satisfied with your Intertec purchase, you can get your money back at any time during the original factory warranty.* Or, in the unlikely event your equipment should become inoperative during the first few weeks of the warranty period, we will

*At participating dealers only. Refunds are prorated.

THE BEST!

FEATURES

● True multi-user capability—network up to 255 users. ● Up to 1.5 Million bytes of local, off-line user storage. ● Four models of user workstations available. ● 64K Internal memory in each workstation. ● A CP/M† operating system. ● 10 – 384 Megabytes of auxiliary disk storage.

COMPUSTAR™

replace it for you! And we'll even provide a reimbursement allowance to cover your cost of returning the system to us.

Go ahead. Review the pricing and performance specifications of *all* the microcomputers available today. We think you'll agree with us. . . ours are *still* the best! If you want uncompromised performance, competitive pricing, sophisticated expandable products and just plain peace-of-mind, you'll want Intertec.

Ask your dealer about Intertec's SuperBrain and CompuStar microcomputer systems. Or, call or write us at the address below and get more information on today's best values in single and multi-user microcomputer systems.

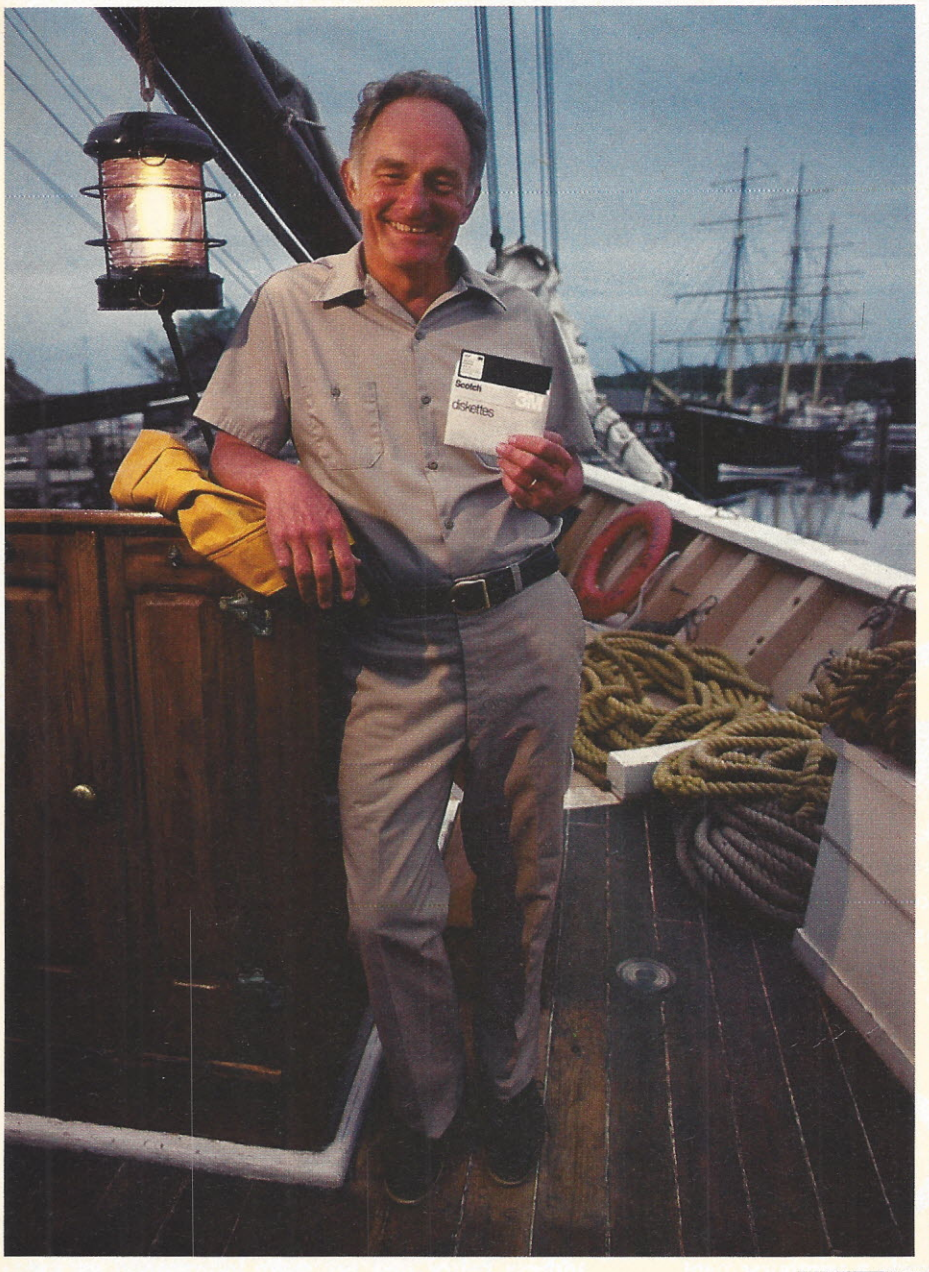
INTERTEC DATA SYSTEMS®

2300 Broad River Rd./Columbia, SC 29210
(803) 798-9100/TWX: 810-666-2115

†CP/M is a registered trademark of Digital Research, Inc.

CIRCLE INQUIRY NO. 48

"This year, I'm taking 2,000 people sailing. I wouldn't trust the travel arrangements to anything less than Scotch® Brand Diskettes."



Eben Whitcomb, Owner-Operator, Dirigo Cruise Company, Clinton, CT

Eben Whitcomb runs the largest windjammer cruise business using American flag ships. He uses Scotch diskettes to keep track of thousands of names, bookings, sailing times, manifests and general ledger. While his computer saves time and repetition, Scotch diskettes assure him that vital information will be there when he needs it.

Dependable Scotch media can work just as hard for you. Each Scotch diskette is tested before it leaves our factory, and guaranteed error-free. So you can expect it to perform exactly right.

Scotch 8" and 5¼" diskettes are compatible with computer/diskette systems like TRS-80, Apple, PET, Wang and many others. Get them from your local 3M distributor. For the one nearest you, call toll-free: 800/328-1300. (In Minnesota, call collect: 612/736-9625.) Ask for the Data Recording Products Division. In Canada, contact 3M Canada, Inc., Ontario.

If it's worth remembering, it's worth Scotch Data Recording Products.

3M Hears You...

3M

CIRCLE INQUIRY NO. 55

LETTERS

The naked computer

Re: "The Classroom Computer is Naked!" (*IA* Mar 81), I am a high school student who uses a computer, and I'm shocked at the viewpoints of the article's author, Frank L. Lambert. The computer system that we have at our school is not a complex system, but it is very instructive for the students.

Lambert complains about the lack of available courseware. In my opinion, this is an asset rather than a drawback. This affords the student with the opportunity to learn how to use the system while writing the required programs.

As to his suggested solutions, I don't agree. His advocacy of a national network contradicts what he had said earlier in the article: that timesharing is not a good idea. Concerning his suggestion for wider use of videodisks, I believe this would limit the imagination of the student somewhat.

Since the computer is used in almost every type of business, any education in the field should be encouraged.

Michael T. Walker
Bath, ME

The article is a remarkable collection of half-truths, misleading generalizations and straw men. Although computer educators disagree over the best approach to computer literacy, I know of no educators promoting computer literacy as Lambert describes it: "A deep understanding of computer functions and programming." He certainly has no difficulty toppling this straw man.

His diatribe on commercial courseware ignores products that have been available and in use for over 18 months. Programs that he says do not exist—those that accommodate many levels of student performance and keep records of student progress—are available from at least three major publishers, and not just in mathematics.

Having dismissed current efforts, he proceeds with his own images of the future: courseware stored on central computers and piped into homes and schools, and computer-assisted video instruction. I agree that each of these concepts will have a productive impact on education, but most educators do not share an image of the future that includes either a widespread unmodifiable curriculum as he implies in the first, or a very expensive lab in which students sit and get a major portion of their instruction "from art to zoology."

Computers are being used in schools today in a wide variety of instructional applications. It is an exciting challenge to improve our efforts in these areas, and we all agree with Lambert that improvement is necessary. Educators are active in teacher training, curriculum development, and idea sharing through conferences and newsletters. Others concentrate on dissemination of public domain courseware or evaluation of commercial programs. Some groups seek to influence legislation, the content of courseware or the licensing policies of the publishers. Others are actively producing high quality software in large quantity and distributing it at reasonable prices.

William J. Wagner, Ph.D.
Co-ordinator for Computer Education
Santa Clara County Office of Education
San Jose, CA

My challenge to you is to take any half-dozen samples from major programs into an average *elementary teacher's classroom—in contrast to the vocationally-based area where you work. Would they be rated by the users as* high-grade *teaching aids? If you would reread my article, you would find that I did not suggest that there are no multigrade major programs. I said the prospect is grim if you expect to find high-grade courseware. Which of the "three major publishers' " programs do you rate as A-grade?* ***FLL***

Computers by mail update

While I enjoyed Tom Fox's article "Update: Computers by Mail" (*IA* Mar 82), I was disappointed to find that our company was omitted from the listing of mail order sources. Our 56-page catalog contains a complete line of standardized checks, invoices, statements, diskettes, ribbons, printwheels and other accessories geared specifically to the microcomputer user. We will be happy to send a free catalog to anyone requesting it.

James R. Thatcher
Nebs Computer Forms
78 Hollis St.
Groton, MA 01450

We would like to bring attention to our current mailing address. The incorrect address was published in the chart that accompanied your article.

Jeremy B. Kline
Priority One Electronics
9161 Deering Ave.
Chatsworth, CA 91311

The computer stores would have you believe that you will receive good support if you buy from them at list price. The question that needs to be answered is "Do you get good support at a reasonable price?"

Consider the following purchase: Apple II with 48K bytes, disk drive with interface card, Zenith monitor. You can save about $550 by ordering through the mail. Based on the $50 per hour figure quoted for support, the amount saved equates to 11 hours of support. Buy this system at the computer store and see if you can collect 11 hours of support.

The facts of the matter are that most anyone can do well by ordering through the mail by exercising a little judgement. Mail order is here to stay, whether Apple and Computerland like it or not.

M.K. Powell
Redmond, WA

Price update

The article "Data Base Managers: Four for the Apple" (*IA* Apr 82) was well-written. The discussion of our Datadex system, however, was not up-to-date in its price. Current price is $150.

William Lohse
Vice-President of Sales and Marketing
Information Unlimited Software
Berkeley, CA

Revised guide available

In regard to the excellent article "What to Do Until the Computer Comes" by Rocky Smolin (*IA* Mar 82), I would like to add a few comments.

ASK Computer Systems provides several support services to its customers—such as the installation planning guide referenced in the article. However, to allay any confusion among our customers and your readers, note that this particular guide is no longer in use.

A revised Implementation Planning Guide provides a checklist of steps to take for a successful MANMAN installation, as well as guidelines for establishing project teams, defining principles techniques and operating procedures. It is available to users through our Software Subscription Service.

Mark Ripma
ASK Computer Systems
Los Altos, CA

Hexadecimal is here

The hexadecimal numbering system—a system whose time has come! Jim Tallman is commended for his discussion of it in your recent feature article (*IA* Feb 82). Its use is expanding. It is used to specify computer addresses. And memory contents. TI puts out a calculator that performs hex arithmetic. The hex system facilitates calculating binary sequences—such as the number of ancestors so many generations back. Clearly the Arabic-decimal system will receive early retirement.

We differ with Mr. Tallman on one point only—his favor of using letters of the alphabet for supra-nine digits. We feel that including six more characters on typewriter and printer heads is a small price to pay for avoiding the confusion that his letters attend. For instance, I am presently using some OAC5's in the design of control systems for testing machines. How should they be carried in inventory? Are those first three characters digits or letters of the alphabet? My computer filing system is set up on clear differentiation. I can file them in eight different places. No matter how I file them, the next person looking for an OAC5 will have to guess where to look. Ridiculous. As long as letters of the alphabet are used for the supra-nine digits, the hexadecimal numbering system is not a system. It is a mess.

It is suggested that we drop the "mess" characters and adopt a fully computer-compatible system.

James E. Hubbell
Indianapolis, IN

More on computer artists

Your February 1982 issue has some very informative articles. Particularly, the article on graphics for small businesses showed a great deal of research. Though it is good to see an article on art, the article on Howard Ganz was dreadfully misinformed about art and artists in the computer graphics field. There have been many exhibits of art made with the aid of computers. These exhibits have been mounted since the 1960s and there are a number of internationally known artists in the field. I hope you will continue to do profiles of computer artists in the future.

Nancy Gerbarg
New York, NY

Pocket exchange

I have been using a TI 58C for the last several years to help price my custom jewelry and do other calculations in my business. I intend to buy a pocket computer soon to replace the calculator, which is programmed to its limit several times.

Bob McElwain's "Power in your Pocket" column has been very useful in helping me see the power of the PCs. I was concerned that I should bypass the "toy" and buy a more expensive micro. Now I see the pocket computer as a

COMMODORE VS. IBM

APPLE, TANDY AND ALL THE OTHERS

"READ THE CHART AND SEE WHICH COMPUTER COSTS LESS AND GIVES YOU MORE FOR YOUR MONEY."

—WILLIAM SHATNER

COMPARE OUR $995 COMPUTER

FEATURES	COMMODORE 4016	IBM®	APPLE II®	TRS-80® MODEL III
Base Price	$ 995	$1565	$1330	$ 999
12″ Green Screen	Standard	345	299	NO
IEEE Interface	Standard	NO	300	NO
TOTAL	$ 995	$1910	$1929	$ 999
Intelligent Peripherals	Standard	NO	NO	NO
Real Time Clock	Standard	NO	NO	NO
Upper & Lower Case Letters	Standard	Standard	NO	Standard
Separate Numeric Key Pad	Standard	Standard	NO	Standard
Maximum 5¼″ Disk Capacity Per Drive	500K	160K	143K	178K

These systems were configured to approximate the capabilities of the 16K PET® 4016. Disk drives and printers are not included in prices. Models shown vary in their degree of expandability.

WHY COMMODORE

The idea of a computer in every office and home used to be science fiction. But that idea is now becoming reality.

The question is, with so many to choose from, which computer should you buy. When you consider the facts, the clear choice is Commodore:

1 Commodore is the only personal computer company with a full line of computers—from our $299.95 VIC-20 to the economical PET® and CBM™ (see chart) to our new SuperPET computer that speaks 5 computer languages.
2 Commodore is the only U.S. personal computer company that manufactures its own semiconductor microprocessors—the "heart" of all personal computers. As a result, Commodore's computer system is more affordable.
3 Commodore's proprietary "6502" microprocessor is so technologically advanced and reliable that it's used in all Apple and Atari computers, as well as many others.
4 Commodore's CBM provides more storage power—1,000,000 characters on 5¼″ dual disks—than any system in its price range. More than IBM. More than Apple. More than Tandy.
5 Commodore computer systems can be expanded to meet the needs of a growing business.
6 With over a quarter of a million computers sold worldwide, Commodore is proven for performance and reliability.
7 Sales in excess of $200,000,000 annually.
8 Commodore is listed on the New York Stock Exchange.

USES AND APPLICATIONS

Word Processing. It's easy on Commodore—the most versatile, efficient and economical computers in their price range.

Financial Planning and Budgeting. Through the use of VisiCalc™ [1], the electronic worksheet. It lets you explore all your financial alternatives in seconds.

Dow Jones Portfolio Management System[2]. Gives you up-to-the-minute data on over 6,000 securities. And more.

Data Management and Retrieval System. OZZ[3], our information wizard, makes it easy for you.

Doctors' System. Our Medical Accounting System (MAS)[4] offers a fast, flexible billing and accounts receivable package.

Legal Time Accounting System (LTA)[4]. Automatically processes activities by client, attorney and action.

Accounting and Bookkeeping Systems. • Accounts receivable • Accounts payable • Payroll • Inventory control • Job costing • Engineering • Personnel recordkeeping • Tax preparation.

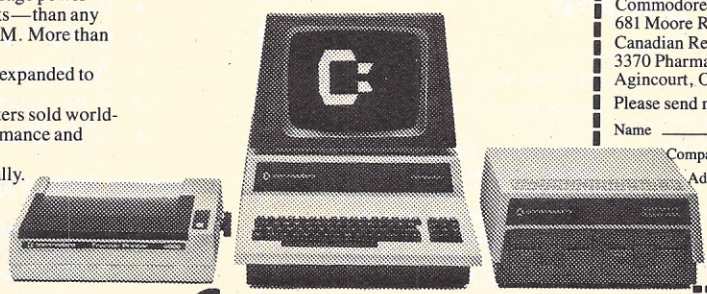
WE WROTE THE BOOK ON SOFTWARE

The Commodore Software Encyclopedia is a comprehensive directory of software programs for: • Business • Education • Recreation • Personal Use Contains over 1,000 software applications to choose from. Pick up a copy at your local Commodore dealer.

FULL SERVICE, FULL SUPPORT

Commodore dealers throughout the country offer prompt local service. And our new national service contract with TRW provides nationwide support. TRW is the largest third-party related computer service organization in the U.S., with over 2,000 skilled technicians, nationwide.

1 VisiCalc is a Trademark of Personal Softwear, Inc.
2 The Portfolio Management System was created by Micro Business Systems, Inc.
3 OZZ was created by the Bristol Software Factory.
4 MAS and LTA were created by Cimarron Corp.



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Company _____ Title _____
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Interest Area
☐ Business ☐ Education ☐ Personal

commodore COMPUTER

CIRCLE INQUIRY NO. 15

good step into Basic and also very useful itself.

Robert Hallett
Oakmont, PA

Setting things straight

Re: "System of the Month" (*IA* Feb 82), on the IBM Personal Computer. A portion of the article states "Soon to be available are the CP/M-86 operating system and the UCSD Pascal environment by Digital Research."

As your article stated, CP/M-86 for the IBM P.C. will soon be available through IBM. However, Digital Research offers Pascal/MT + for its CP/M operating system, not the UCSD Pascal.

Patricia S. Lucas
Digital Research
Pacific Grove, CA

Softec Microsystems (San Diego, CA), sole licensor of the UCSD Pascal p-System, also pointed out that it was Softec—not Digital Research—that licensed UCSD Pascal to IBM. ***TF***

Tax audit

Re: "What the 1981 Tax Law Means to You" (*IA* Mar 82). While informative, the article contained several errors regarding the tax consequences of purchasing $1,000 of software. The article correctly states that the present value of $300 received in Year 1 is $300. However, $300 invested at 20% simple interest will generate principal and interest of $622.08, not $400.

Moreover, the present value for the "combination purchase" tax benefits should be $310.59, rather than $296, computed as follows: 145 + (65/1.20) + (63/1.20^2) + (63/1.20^3) + (63/1.20^4) = 145 + 55 + 43.75 + 36.46 + 30.38 = 310.59.

Finally, the article reaches the wrong conclusion: when yield rates are low, the combination purchase is more advantageous, since low interest rates will have little effect on the present value of the future tax benefits. Conversely, the direct purchase is the correct choice when interest rates are high. In the problem posed, a 23%, rather than 20%, yield is neutral, that is, either choice will result in equal tax savings at that yield.

Darryl W. Tang,
San Francisco, CA

Tangled up

Re: "Micro-Mathematician" by Dr. John C. Nash (*IA* Dec 81), I tried to run your Bauer-Reinsch matrix inversion but got tangled up in the transliteration from Comstar Basic to Microsoft. Can you provide a listing in Microsoft, or some similar language?

Douglas B. Nickerson
La Canada, CA

The Bauer/Reinsch Gauss Jordan matrix inversion is one of the most compact for performing this particular task. Unfortunately, it is also highly convoluted. I suspect users will have trouble with using the code listed in this column because no mention is made of the internal array structure used. I intend to write about these matters in a future column. For those who cannot wait, the idea is to store a symmetric, square matrix having two dimensions in a vector—a single dimension array—in row order. This puts the (1,1) element of the matrix in position 1 of the vector; (2,1) in position 2; (2,2) in position 3; (3,1) in position 4; and so on. The general rule, using A for the matrix and V for the vector is to put A(i,j) in V(i(i-1/2 + j).*

The listing unfortunately uses the label A for the vector that stores the matrix labelled A in the column text. I included the listing mainly to indicate the complexity of the code used to demonstrate the performance of Comstar, and had not intended to discuss this algorithm until a later column. ***JCN***

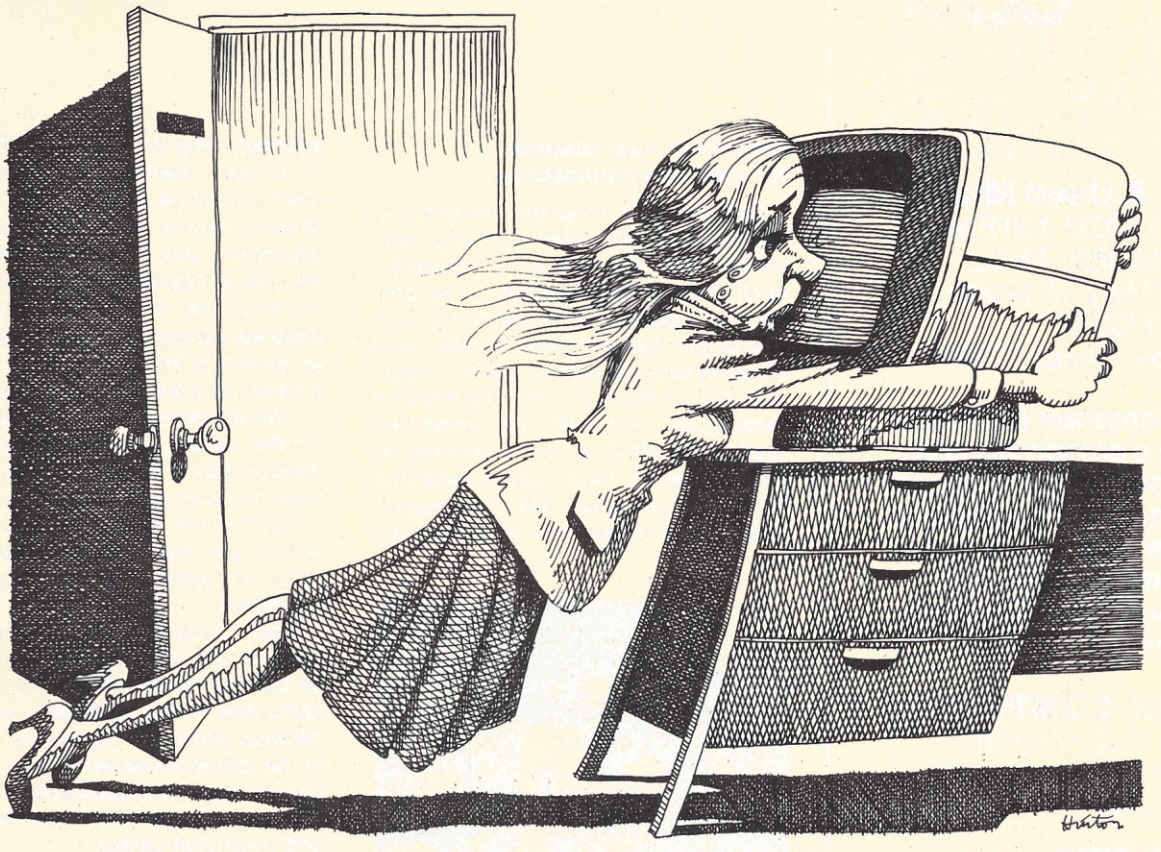
Best of both worlds

"Timesharing vs. buying a microcomputer—which is best?" asked David D. Busch and William M. Taylor (*IA* Mar 82). Consider a blend of both. Microcomputer owners use our telecommunications software, The Micro Link, to hook into timesharing services. They minimize connect time, store some data on their own diskettes, and do part of the processing on their micros; timesharing provides electronic mail, part of the data storage and more powerful processing when needed.

Geoffrey Sinclair
Woodcraft
Oakland, CA

For the Record

Re: *Software Review* by Alan R. Miller (*IA* Mar 82). Although Plink-II is authored by Phoenix Software Assoc. (N. Easton, MA), it is distributed exclusively by Lifeboat Assoc. (New York, NY).



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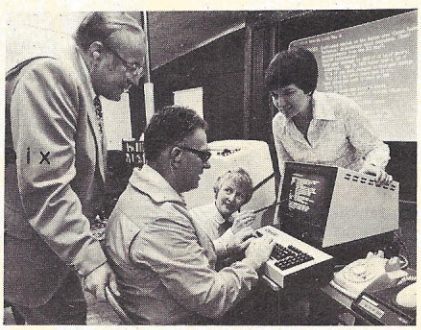
UPDATE

Electronic mail adapted for deaf communications

Deafnet is a program designed to improve communications among deaf people with the aid of a computer-controlled message system. The concept is an adaptation of electronic mail.

It began operating last summer with 65 users who had participated in a three-year study funded by what was then the Department of Health, Education and Welfare. Deafnet is now sponsored by the non-profit Deaf Communications Institute, Framingham, MA. The program functions in conjunction with Telemail,



operated by GTE Telenet Communications, Vienna, VA.

Each user has a terminal, a regular telephone and a coupler, which connects the phone to the Telemail network. Using the terminal's keyboard, messages can be sent or received.

Cost is minimal: a 30-word message sent to 10 persons in the greater-Boston area over Deafnet is transmitted for 7 cents.

Beyond costs, however, is the hope that Deafnet will provide employment opportunities for handicapped individuals.

Atari to offer summer computer camps

Atari Computer Camps represent the first effort by a major home computer manufacturer to fully sponsor summer camps for 10 to 18-year-olds interested in computers. Atari, Inc. (Sunnyvale, CA) will conduct eight camp sessions this summer, two in each of four locations.

"Atari Computer Camps will give young people an opportunity to learn about computers, at whatever level, with an outstanding curriculum in an informal camp environment," Raymond E. Kassar, chairman of the board and chief executive officer, said. "Atari is already heavily involved in computer education, and Atari Computer Camps will give us opportunities to make further contributions in this field. Our camp sessions will each last four weeks, which we believe is the time necesary to impart a meaningful experience," Kassar said.

"We are designing our own curriculum for the camps," Kassar added, "under the direction of Robert A. Kahn, who has been involved with computers and education for the past 15 years. We will recruit and train our own instructors, many of whom will be professional educators."

Atari Computer Camp sessions will begin in late June or early July, and will be conducted on school and university campuses in the northeast, southeast, midwest and west. Day-to-day operation of the camps will be handled by Specialty Camps, Inc., an organization with some 25 years of experience in running theme and traditional camps.

"While the formal instruction sessions will last for two hours each day, all of the computers and software will be available to campers during their free time. We feel that it is important to create an informal learning environment to complement the more structured programs," Kassar said. The daily schedule will also include traditional summer camp activities.

Equipment used will be Atari 400 and 800 computers.

Software locator serves home and business markets

Finding the right software for a computer system is not easy. The software industry is made up of thousands of companies and end-user awareness is low.

Sofsearch, a software locator service provided by CCS Inc. (San Antonio, TX), seeks to remedy this situation.

Subscribers will have access to information about software products available for systems ranging from small home computers to large business or scientific mainframes. Sofsearch began late last year and by the end of January had built a data base of 10,000 software programs and about 5,000 software vendors.

For a $125 service fee, Sofsearch provides reports on available software products that meet up to five sets of user-specified criteria, including the computer system to be used or the industry or activity to be served.

'Over-the-counter' computer sales expected to expand

"Over-the-counter" computer has been suggested as a generic term to apply to the micro marketplace, which is expected to generate $9 billion sales by 1985.

In a market research report, Frost and Sullivan (New York, NY) defined over-the-counter computers as relatively inexpensive, sold by stores, mail order and other retail outlets. Such machines are unified more by their mode of distribution rather than end-user characteristics, according to the report.

Frost and Sullivan claim that the total microcomputer dollar market between 1982 and 1985 will be $22.5 billion, a 60% yearly growth rate.

The hobby market, though still a major element of the mail order market, has given way to business, and will be surpassed by home consumers, the report says.

The software market will continue to grow, the report indicates, with increasing demand for easy-to-use, low-cost products.

Computer literacy seen as vital educational topic

Today's educators need to add a "C" —computer literacy—to the traditional three Rs, according to a professor of computer and information science at the University of Oregon, Eugene. David Moursund believes that children will need a functional knowledge of computers to compete in the future job market.

One estimate holds that by 1985 a high percentage of all jobs will involve computer use in some way, and that those who don't know how to use them will be at a definite disadvantage. Moursund believes that the educational system has not kept up with this trend because not enough teachers are computer-literate and because there are not enough computer-related instructional materials.

The ability to use computers could become as important as the ability to read and write when looking at future employment, Moursund said.

"Our educational system is completely dependent, in essence, on how teachers and parents view the world. If teachers won't adjust to using computers, to this change in the world, it's going to be very hard for the kids to adjust to it," Moursund said.

GAME CORNER

by Patrick and Leah O'Connor

Cube Trek

In a recent column (IA Dec 81), we considered ways to make a Rubik's cube interface with a computer system, and explored methods of backtracking from a scrambled cube to the original unscrambled state. There are algorithms (procedural formulas) for getting a scrambled cube into a solved configuration. Some of these permit solutions in less steps than were used to scramble it in the first place.

Many books and articles describe ways of solving a scrambled cube. Now, one of these methods is available in a program for the Apple II. *Rubik's Cube Unlocked* by Jeff Gold (Double-Gold Software, Saratoga, CA) promises to solve any cube, and it does. It is a machine language program for the Apple II with 48K-byte Applesoft, and DOS 3.2 or 3.3. It has superior high resolution graphics for either color or black-and-white monitors.

Like many of the solutions found within the recent rash of paperback books, *Rubik's Cube Unlocked* uses a fixed method for solving all cubes. It starts with the top edges, then proceeds to the bottom edges. The program is a tireless and infinitely patient teacher. If a cube is solvable—if it hasn't been taken apart and put back together wrong—this game will eventually solve it. The graphics screen layout does a very good job of presenting the information needed to follow the program's instructions. The screen displays an isometric view of the cube, a two-dimensional view of each of the six sides, and a two-dimensional view of the side to be turned—both before and after the move is made.

Mr. Gold's program allows for several modes of use. The program has a short demo with some appealing graphics. Once the cube is solved, one can use the Patterns option to learn to create several different designs. If you want a challenge, the program will create a custom cube for you to solve. You decide how many random moves the computer will use to make the random cube. Once a random cube has been formed, the computer can solve it, or you can attempt your own solution by using the "Play" option, which lets you enter commands.

This is a well-designed program that can solve any legitimate cube. It will also teach you how to solve a cube by a fixed routine, and it will help ease the frustrations of looking at an unsolved cube, but it will not make you a "Cubemeister." Since the program uses a fixed routine for solving a cube, it may take many more moves to solve a cube than it took you to mess it up in the first place. Even though it operates expediently, the program could probably be beaten by an expert Cubist. This in no way detracts from the value of the program, but does indicate the superiority of the human mind in selectively grasping complex patterns and identifying optimum solutions.

One for the Trekkies

From Rainbow Computing (Northridge, CA) comes *Super Stellar Trek* by Tom Burlew. Most hobbyists reading this column are already familiar with *Star Trek,* or its predecessor *Spacewar* in some incarnation or other. Nevertheless, we'll assume the features of this new release are unfamiliar to you, and summarize the program's strategic and operational characteristics.

You are the commander of a space dreadnaught called the USS Enterprise. You may select to use either the crew from a previous game (if stored on disk) or to assign names to the various command titles (science officer, transporter operator, weapons officer and so forth). You serve the Federation (the good guys) and are beset by an implacable enemy called Klingons. Nobody has ever heard of the Organian peace treaty in this alternate-universe version of the *Star Trek* scenario, so you can blast away at these Klingons without any inhibitions except for their unpleasant habit of blasting first.

Now that the scene is set, what does *this* version of the game have, or do, differently or better than all the others?

Early versions of *Star Trek* were all text and no graphics. Later developments included graphic playing fields (sectors) and real-time movement modeling the action of space battle realistically (*Spacewar,* implemented on CRTs in early 1960s minicomputers, by contrast, started as all graphics/animation and almost no text). By the standards of microcomputer animation and real-time graphics simulation, *Super Stellar Trek* is among the best we've seen.

If the armory of the television Starship Enterprise is taken as a starting point, the photon torpedos, phasers, and shields with which the game is equipped are all standard Federation starship offensive and defensive armaments. We found an available option of "ramming" the enemy with your starship—a tactic we can't remember Captain Kirk using, but it worked well in *Ben-Hur,* didn't it?

A goodie we don't remember from the television show was the availability of a long-range transporter at starbases that

can "haul in" a battleship in distress upon receipt of a call for help. Calling for help, however, is considered cowardly, and detracts from your overall battle score.

Power—the power for the battleship—comes from (what else?) Dilithium crystals, which may be mined from the crust of certain planets. Mining crystals and docking at starbases are the two methods of bolstering sagging energy reserves. The loss of energy is imminent as each battle is fought, and the ship moves from sector to sector and quadrant to quadrant—giving a realistic impression of how fuel reserves and energy usage would occur in a real physical system. The real-time factor, again, seems to be well portrayed here.

Maneuvering—to move anywhere on the board—the captain can direct the ship to move within a visible tactical display by use of numbers that indicate the CHANGE in the present position of the starship. The movement within a sector (the tactical screen) is indicated in quadrants (there aren't four of them, in spite of the name). To move from row 5, column 7, to row 8, column 8, the command to move must be given as (M .3 .1). The quadrants are indicated as decimal fractions (.3, for instance) when the captain wants to move the ship a short distance—within the tactical screen). Larger moves, from sector to sector, are done with whole numbers. To see what's in other sectors, a separate strategic screen must be called up.

Normally, what's in all sectors isn't observable on the strategic screen either, only what's in the sectors closest to the starship's present position, and as the starship moves from sector to sector, what has already been observed remains shown as a series of status-indicating numbers. Occasional supernovae and black holes complicate life in some quadrants (supernovae complicate it to the point of extinction). With judicious use of the strategic screen and immediate return to the tactical screen, you can direct the Enterprise around the known universe with reasonable success.

While navigation is performed using relative addressing, firing phasers and photon torpedoes is done with absolute addressing. In other words, if there is a Klingon on row 4, column 6 of your strategic screen a (PHO 4 6) command will fire a photon torpedo at the enemy in that location, no matter where you are. However, if you want to move to that location, and are at row 4, column 4, you will need a (M .0 .2) command. When you're learning the rules, these different "addressing modes" make it harder to acquire proficiency. This is maybe just a minor quibble, because after you adapt to the different types of commands, you'll use the right form every time—won't you?

Phasers are operated in similar style to photon torpedos, except that the amount of energy in each blast must be specified.

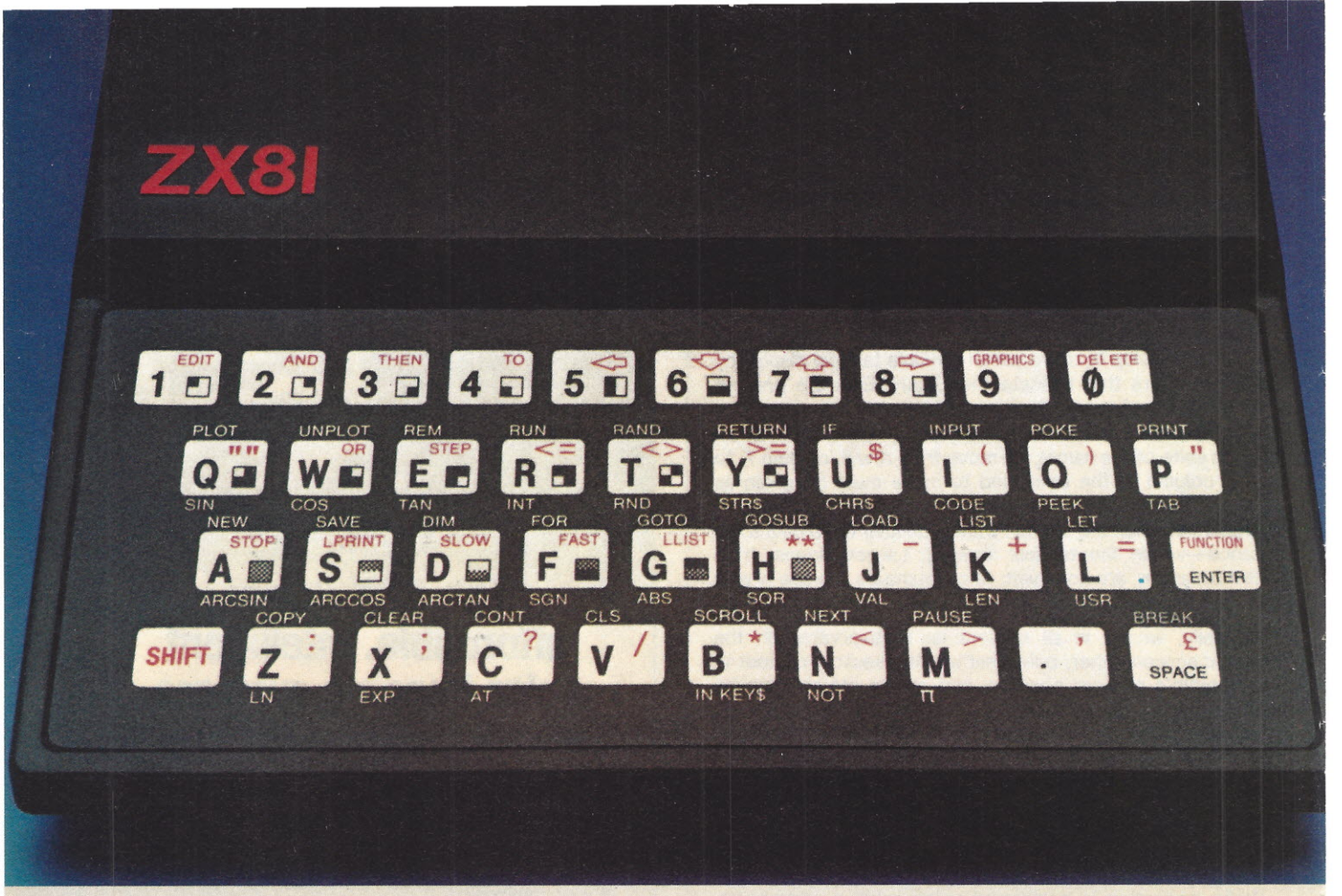
Ramming an enemy vessel is also done by using absolute quadrant addressing, but ramming and self-destruct are last resort tactics.

Perhaps the "row, column" method of identifying a position on the screen could be replaced by the more standard "X, Y" method of representing 2-dimensional Cartesian co-ordinates. We don't know if "row, column" is the way other Trek games currently operate, but for almost any other application where two-dimensional co-ordinates are used, "X, Y" (horizontal, vertical) is the standard way to go.

Look at the difference between firing a photon torpedo at a position and moving to that position previously discussed. Isn't it possible to make these methods of identifying a place on the screen a bit more consistent?

Queries that are answered by typing in a letter (no need to hit RETURN) and by entering a letter or string (RETURN necessary) seem to alternate without any particular pattern. Again, we'd like to see a bit more consistency.

No doubt Rainbow Computing is now working on *Son of Super Stellar Trek*. Maybe the company will incorporate these suggestions into the next Trek generation. Meanwhile, *Super Stellar Trek* gets a "yes" vote. □



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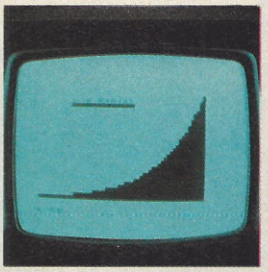

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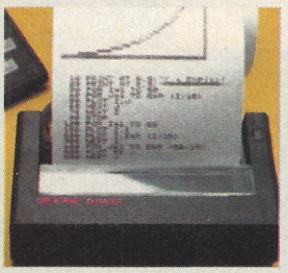

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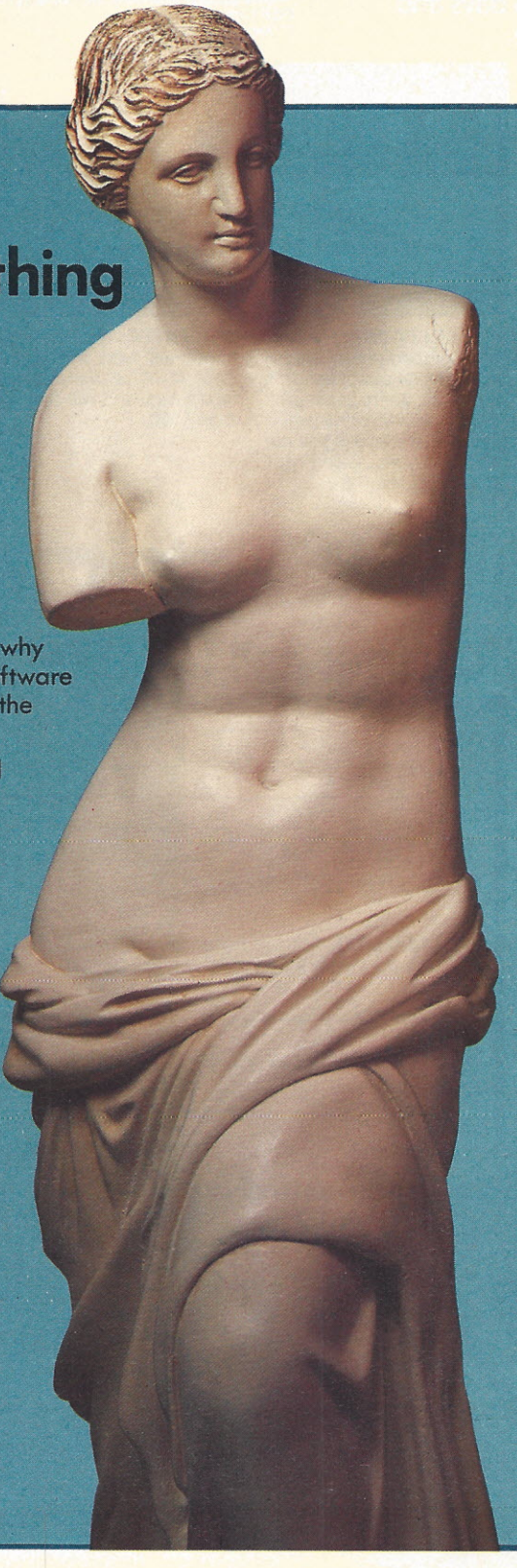

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THE MICRO-MATHEMATICIAN

by Dr. John C. Nash

Gaussian Elimination

This month we will consider one of the most widely used tools in numerical mathematics. Gaussian elimination (and its variants) are applicable to almost all problems in numerical linear algebra—calculations involving matrices.

A common matrix calculation is the solution of simultaneous linear equations. A high school example might be the pair of two equations in two unknowns (v and w)

$$2\,v + 3\,w = 11 \qquad (A)$$
$$4\,v - w = 1 \qquad (B)$$

The usual high school solution methods are substitution or elimination. Substitution takes one equation, let it be (A), and solves for one of the unknowns, say v, in terms of the rest, in this case w. That is,

$$v = (11 - 3\,w) / 2$$

This result is then substituted into the rest of the equations, leaving some new equations with one fewer unknown. That is,

$$4\,v - w = 4 * (11 - 3\,w)/2 - w = 22 - 6\,w - w = 22 - 7\,w = 1$$

The solution for one unknown and substitution steps are continued until the substitution gives an unknown equal to a number, that is,

$$7\,w = 22 - 1 = 21 \text{ or } w = 3$$

By using earlier equations for one unknown in terms of the others in an appropriate order, we can then obtain the full solution,

$$v = (11 - 3\,w)/2 = (11 - 9)/2 = 1$$

The elimination method results in the same answers, but arrives at them by a slightly different approach. The essence of an equation is that both sides are equal. Therefore, performing equal operations on both sides of an equation preserves the equality. Thus adding the same amount to both sides of an equation will leave the equation valid. In particular, we can add two equations together, or add a multiple of one to another. Let us multiply equation (A) above by -2 and add it to equation (B). This is the same as subtracting 2 times (A) from (B).

-2 times (A)	:	$-4\,v$	$-6\,w$	=	-22
(B)	:	$4\,v$	$-w$	=	1
-2 (A) + (B)	:	$0\,v$	$-7\,w$	=	-21
Divide by (-7)	:		w	=	3
Substitute in (B)	:	$4\,v$	-3	=	1
Add 4 both sides	:	$4\,v$		=	4
Divide by 4	:	v		=	1

So much for the review of high school methods. How do we translate these ideas to working computer programs? First, let us write the equations in matrix form, that is,

$$A\,\mathbf{x} = \mathbf{b}$$

where A is an n by n matrix, which for our n = 2 example, is

$$A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$$

x is the vector of unknowns and **b** the vector of right hand side elements, i.e.

$$\mathbf{x} = \begin{bmatrix} v \\ w \end{bmatrix} \qquad \mathbf{b} = \begin{bmatrix} 11 \\ 1 \end{bmatrix}$$

We will look at the use of elimination methods rather than substitution because the latter requires that we somehow handle the unknowns—a symbolic operation—while the elimination allows us to exploit matrix structure and indexing. In the above example, the unknowns always occupy the same position in the tableau. Rather than develop a complete tableau in memory, we will allow parts of arrays to be overwritten with new information to save storage.

Elimination operation

The basic elimination operation, that of adding s times one equation to another, will store its result on top of the second equation. Suppose we wish to add s times equation i to equation k. The result of this operation has ($A_{kj} + s * A_{ij}$) multiplying the unknown x_j, for $j = 1,2,\ldots,n$. The right side element becomes ($b_k + s * b_i$). Letting this equation replace equation k of the original set is equivalent to replacing row k of the starting matrix A with the appropriate elements above. Similarly, b_k is altered. Note that if we store **b** in an extra column of A, that is, make A an n by (n + 1) matrix, the same numerical results are obtained as if we had kept the right side separate. This is a saving in programming as well as in execution time for linear equation solutions and is part of the Basic code presented later.

The elimination operation is used to set particular coefficients in the new equations to zero by appropriate choice of the multiplier s. The coefficient or matrix element set to zero is therefore eliminated. Suppose that we wish to eliminate the coefficient of unknown x_m in equation k. The choosing

$$s = -A_{km}/A_{im}$$

will obviously force this to happen in the elimination operation of adding s times equation i to equation k. The element A_{im} is frequently referred to as the pivot in this operation. If the pivot is zero, attempts to compute the multiplier s will result in an error, and a good deal of effort in programs to solve linear equations by elimination methods focuses on arranging that such a zero-divide does not occur.

In order to solve a complete set of equations using the basic operation just presented, the following set of eliminations must be performed. Given the coefficient matrix A, all elements of column 1 except the first are set to zero by elimination. This uses element A_{11} as pivot. Then, using element A_{22} as pivot, all elements in column 2 except for the first two are set to zero. Then all elements of column 3 except for the first three are eliminated, and so on until the matrix has only zeros in the lower triangle. That is, the equations have the structure

$$\begin{bmatrix} N & N & N & N \\ O & N & N & N \\ O & O & N & N \\ O & O & O & N \end{bmatrix} \begin{bmatrix} N \\ N \\ N \\ N \end{bmatrix} = \begin{bmatrix} N \\ N \\ N \\ N \end{bmatrix}$$
$$A \qquad \mathbf{x} \qquad = \mathbf{b}$$

where N represents a non-zero number, O a zero.

The last equation in the set can now be solved immediately by a division,

$$x_n = b_n / A_{nn}$$

(A_{ij} will be the i,j element of the current matrix.) The second to last equation is solved by substituting this value into it and solving for x_{n-1}. Then x_{n-2} can be found and so on until a complete solution is obtained. This process is called back-substitution. However, elimination can be used to perform an equivalent calculation. The variant of the solution method that results is often called the Gauss-Jordon method, though there is some debate over the involvement of either mathematician in its development.

In order to use the elimination operation to solve the triangular set of equations, we can use A_{nn} as pivot and eliminate all elements above it in the last column. The zeros created in the triangularization will not be affected since s times zero is still zero. Then the (n – 1, n – 1) element is used as pivot and all other elements in column (n – 1) set to zero. This is continued until the matrix A has only zero elements except for the diagonal, that is,

$$\begin{bmatrix} N & O & O & O \\ O & N & O & O \\ O & O & N & O \\ O & O & O & N \end{bmatrix}$$

Each equation can then be solved independently by a simple division. This can also be performed by elimination if we note that s times equation k added to equation k is just (s + 1) times the equation. Therefore, if

$$(s + 1) = 1 / A_{kk}$$

where A_{kk} is the current k'th diagonal element, then the solution element for this equation is

$$x_k = (s + 1) * b_k = b_k / A_{kk}$$

where b_k is the current k'th element of the right side.

The basic elimination operation corresponds to a matrix multiplication by transformation matrix T, which is n by n. This matrix is totally defined by the quantity s and the row numbers i and k, assuming that the matrix A has n rows. T must be a unit matrix except for element (k, i), which is equal to s. Therefore

$T_{jj} = 1, j = 1,2,\ldots,n.$
$T_{ki} = s$, (row k, column i)
All other elements are zero.

The matrix product

$$A' = T * A$$

will differ from A only in the k'th column. The matrices of type T are one class of elementary matrices. They are useful in developing algorithms because theorems can be proven about them. In particular, it is easy to show that the inverse of T, called T^{-1}, has elements

$T^{-1}_{jj} = 1, j = 1,2,\ldots,n$
$T^{-1}_{ki} = -s$
All other elements are zero.

(Note that this only works if i and k are not equal.) It is hardly surprising that the way to reverse the operation of adding s time row i to row k is to simply subtract it again.

Let us now apply elimination to solve some systems of linear equations. The Basic program code given in listing 1 contains four subroutines that perform the elimination operation on columns as well as rows. They also allow two rows or two columns to be exchanged. Listing 2 gives a program that calls the subroutines to solve linear equations. An example is given in listing 3. To see how the process works, interested readers should answer 'Y' to the question: "DISPLAY MATRIX (Y or N)?".

Listing 4 presents an example for which the process fails unless we take into account the possibility that the pivot element may be zero. In this case, we may be able to find another element that is not zero and use it instead. To do this, we must either renumber the equations, which corresponds to interchanging the rows of the matrix A, or renumber the unknowns, which alters the columns. There is a large amount of experience that suggests that it is sufficient in almost all cases to consider only row exchanges. Listing 5 presents program code to carry this out if the REM is removed from the statement at line 220 of the original program in listing 2. This process, called Partial Pivoting, chooses the largest element of a column as the pivot. Readers may wish to experiment with choosing different pivots—that is the main focus of the programs presented. To improve the efficiency of the calculations, one would not actually perform the row or column exchange, but simply alter some indices. In my experience, this is surprisingly hard to do well. It is difficult to improve the speed of the program by a large relative factor without a lot of work.

Not even pivoting can get around all the difficulties. Suppose that we are given several identical equations. Then at least one pivot will be zero. In this case, there is no unique solution because the matrix A is singular. Readers are warned that a small pivot means that the matrix A is singular. However, the absence of a small pivot does not necessarily mean the matrix is *not* singular, a point many application programmers of statistical and scientific software seem not to appreciate.

The whole question of "small" pivots is quite interesting, and deciding a suitable tolerance for use in a general-purpose linear equation solver can involve quite sophisticated mathematics. Clearly, the value zero chosen in the programs given here is inappropriate except in a didactic context. (See line 380 of listing 2.)□

Program on page 132

Introducing a work processing program so powerful it gives you three programs for the price of one:

SuperWriter™

by Sorcim

The company that brought you SuperCalc,™ the most powerful electronic spreadsheet money can buy, now introduces SuperWriter,™ a work processing program so powerful it combines text editing and printing, spelling checking, and mailing list processing in a single program. In addition, SuperWriter™ interfaces with SuperCalc™ so you can insert tables of figures in your texts.

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Learning with Micros

by Louis E. Frenzel, Jr.

Personal Computer Networks for Education

The two information networks widely available to personal computer owners, The Source (McLean, VA) and Compuserve (Columbus, OH), provide a variety of data services for subscribers who access them through a terminal or personal computer. Many users are beginning to recognize the potential of these utilities in education. Already the two major informational services are offering a variety of educational programs and more are planned.

Both services operate in essentially the same way. The user pays an initial subscription fee, then a modest hourly rate for the time that he is connected to the computer. The user is billed each month for the time used. Both services provide a wide variety of data bases and computational facilities. Virtually any type of terminal or personal computer can be used to access the services.

Compuserve employs several large scale Digital Equipment Corporation model 10 and model 20 timesharing computers. Any subscriber can access this massive computing capability through a local telephone call from more than 260 cities.

Up-to-the-minute international, national and local news, weather and sports are available on the screen, courtesy of AP. Financial information is also available. Timely quotes on more than 40,000 stocks, bonds and options can be seen at the touch of a button. There is also entertainment. Besides a wide variety of computer games, you can also access movie, restaurant and book reviews. Computer hobbyists can take advantage of the wide range of programming languages and aids available. There is also electronic mail. With this feature, you can send and receive messages to and from other subscribers. Compuserve currently has over 21,000 subscribers and is growing rapidly.

The other informational network—The Source—is owned by Reader's Digest. This service employs seven large Prime 750 mainframe computers. Like Compuserve, The Source charges an initial subscription fee, then an hourly rate for connect time. You can tap The Source with a local telephone call in over 350 metropolitan areas.

Similar features for both

Most capabilities are similar to Compuserve. The Source has a Chat mode that lets you talk interactively with any other user on the line at the same time. This is very much like a computer CB radio, as many users actually have "handles." Another information feature is airline schedules. If you'd like to know about flight schedules, you simply type the city name and The Source will give you flights scheduled for that route. You can even do some of your shopping on-line. Over 20,000 items are cataloged and described. You can order them right from the computer and charge them directly to your credit card. The Source currently has over 14,000 subscribers and

estimates that nearly 30,000 people will subscribe by the end of 1982.

All you need to access either Compuserve or The Source is a microcomputer or a terminal. It should have a serial communications I/O port (i.e. EIA RS-232). This serial port is then connected to a communications modem. The modem in turn connects to your telephone line. This can be done indirectly through an acoustic coupler that attaches to the regular telephone handset. Alternately, the modem can connect directly to the telephone lines. Telephone connections are incredibly fast and simple to make. Both networks provide detailed technical information for setting up your computer to talk to their systems.

The two major information services offer a variety of educational programs.

The personal computer information networks promise to further expand the educational potential of the microcomputer.

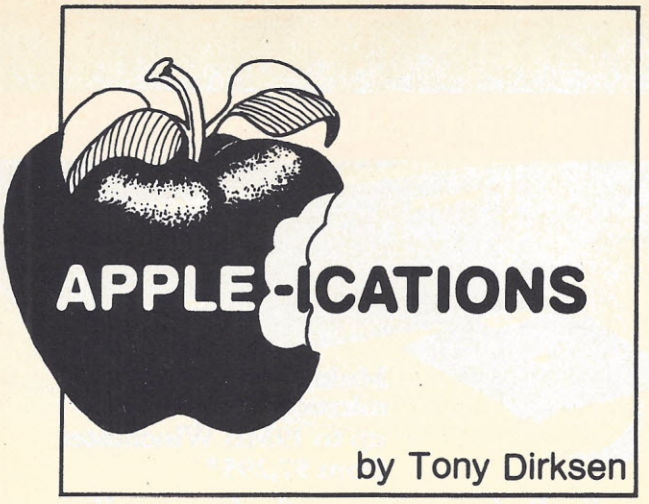
Compuserve recently signed an agreement with World Book Encyclopedia to provide an on-line version of the World Book to subscribers. Once the service is fully implemented, it will provide a wide range of educational data for subscribers. Another Compuserve educational feature is its program that helps high school graduates prepare for the Scholastic Aptitude Test (SAT).

The Source seems to be more advanced in its use of the network for educational activities. It offers a variety of learning programs in foreign languages, language arts and mathematics. Additionally, in cooperation with the Colorado Technical College in Colorado Springs, The Source now offers an array of college courses via the network. In fact, subscribers can complete all of the work necessary for a degree at the Colorado Technical College via the network. The college offers Associate degree programs in a variety of technical subjects. These programs are accredited by the North Central Association of Colleges and Technical Schools and the Accreditation Board for Engineering and Technology. Within a year, The Source expects to have on-line over 20 courses leading to a degree. By using lectures and exams presented on the network, as well as supplementary textbooks, the students complete each course at home via the network. Each course typically runs three hours per week over an 11-week period. Tuition is approximately $210 per course. Interestingly, all admissions and payments can also be completed through the network.

The potential for education over information networks is enormous. Over the past several years, many learning programs have become available for the popular personal computers. Some of these should be adapted to distribution via the informational networks. Better still, perhaps new programs can be developed for these services. In any case, it just takes time.

A factor limiting the widespread use of micros for education lies in distribution of the software. Most computer stores do not stock such learning programs simply because the current demand is not high enough to justify the expense. By making the educational programs available over a communications network, the distribution problem is resolved.

Both Compuserve and The Source are currently soliciting educational material. Typically royalties are paid to the creator. For example, Compuserve pays 8-10% of the connect time fees collected to software contributors. Once the sources and distributors of educational materials get together and work out the details, there should be many valuable educational programs available. □



by Tony Dirksen

So You Want to be a Programming Star...

Like so many of my 13-year-old peers, I was convinced that someday I'd be a rock-and-roll star. The shortest road to success seemed to be down the frets of a guitar, so I invested months of allowance into a Silvertone electric. There was one immediate detour to my career: I had to learn how to play the thing. The only educational tool available for the sum of my remaining nickels was a book more full of promises than lessons. It wasn't until years later—when I could afford a private tutor—that I actually learned much about playing the instrument. Unfortunately, fame had already passed me by.

Many of today's teenagers may have been replaced by archaic rock idols with contemporary technical heroes like Steve Wozniak, Bill Budge, and other programming wizards. As they—and the rest of us—set out to learn more about the ins and outs of programming computers, some of the same frustrations that confront novices in every field of learning will emerge. In order to progress, we must effectively assimilate the information available to us.

Okay, so you decide it's time to begin your education. You bring your first computer home, carefully connect all the components, and start running a "crucial" program called *Stellar Monkeys.* During the next few weeks, you spend 15 hours a day detonating high-resolution primates into oblivion. Guilt-ridden, you take a fleeting look at Visicalc in order to justify those hours squandered amidst the CRT's glowing apes. In time, remembering that the Apple system was acquired to "learn more about computers," you decided to seek some guidance. Returning to the computer merchant, you're confronted by an intimidating wall of books, each claiming to be "an introductory text written without confusing technical jargon." The dealer (who's desiging circuit boards for NASA in his spare time) is insensitive to your confusion. He simply waves his hand at the phalanx of books and says "they're all good."

Advice for the novice

Don't be dismayed. In this month's column, I'll describe some of the ways novices can extend their programming competence on an Apple system. Allow me a couple of disclaimers. First, note that there are many valuable programming guides available today. I've selected a few whose quality has been reinforced through my own experience. You may want to sample others as well. (Consider acquiring Bob Broedel's bibliography of Apple-oriented texts for $2. Write him at Box 20049, Tallahassee, FL 32304.) Second, recognize that we all learn and discipline ourselves in different ways. I like to follow a tutorial that encourages immediate use of the computer —instead of laboring through a text that preaches principles before sharing applications. Others may be different.

Apple includes manuals with each system designed to relay the fundamentals of Basic, but there's more to the language than any single manufacturer's manual can include. One way to broaden this base is to purchase a book of basic programs, then input and study the listings. However, many people don't have the temperament for this approach. You may want to consider reading the following books.

Basic Programming by John G. Kemeny & Thomas E. Kurtz (John Wiley, New York, NY) provides a good starting point. It isn't often that scholastic visionaries are able to focus their ideas for absorption by the masses. Kemeny & Kurtz developed the Basic language as a user-friendly tool for their students at Dartmouth College. In this text, they successfully avoid the temptation to be rigidly academic by providing programs ranging from a baseball simulation to business analysis to specialized sorting routines.

Every computer sports a slightly individualized version of Basic. This book uses the American National Standard for the language, and most programs will run on the Apple computer without modification. (If you confront an occasional snag, refer to the *Applesoft Basic Reference Manual* that came with your system.) However, because it's based on generalized standards, *Basic Programming* doesn't take full advantage of many of the Apple's special features—particularly graphics capabilities.

Computer Graphics Primer by Mitchell Waite (Howard W. Sams, Indianapolis, IN) provides more insight in this area. It's hard to imagine that a field less than a decade old already has a classic. But Waite's book is just that. It contains invaluable program listings that grow more detailed as you get deeper into the book, and even introduces a few intriguing fundamentals of computer animation.

If you're not nurturing a teach-yourself type mentality, you can still investigate programming without pain

Waite opens the book with a review of computer graphics potential, covering the range from micros to mainframes. He then demonstrates step-by-step the creation of high-resolution graphics on an Apple computer. The Applesoft tutorial manual that accompanies your system provides an introduction to hi-res graphics, but only dips into the subject for about seven pages. Waite's more elaborate book is a necessary tool for those serious about using graphics.

Apple's own Pascal manuals are designed more as atlases of Apple Pascal's special features than instructional guides to the language. A neophyte approaching them—or many of the other off-the-shelf Pascal books—is likely to quickly feel lost. Many Pascal guides laboriously describe the structural brilliance of the language, a rhetorical diversion that's likely to send many a novice scampering back to the shelter of Basic.

Apple Pascal: A Hands-on Approach by Arthur Luehrmann and Herbert Peckham (McGraw-Hill, New York, NY) offers additional virtues. There's probably no better book for learning Pascal on an Apple computer. This guide uses a lesson-oriented approach to teaching the language and the operating system, with 14 lessons that consume between two to three hours apiece. It's specifically designed for users of Apple Pascal with only one disk drive. The importance of the authors' strategic one-drive approach can't be overstated. True, Pascal works more smoothly if you have a second drive. Alas, many

users have only one, and this book has been designed to work within the limitations of a more simplistic system.

Be warned. This is the kind of book that leads you across a deceptively smooth path—only to push you into a bed of thorns. You may naively follow their directions, thinking you're near the completion of a program, only to have them intentionally thrust you into a mistake that invalidates the work you've just done. Their theory, I suppose, is based on that time-honored adage of learning from one's mistakes. But take heart—they always explain in precise detail how to get back to where you've come from.

Admittedly, the book doesn't cover every feature of the language, but does get you using the Apple's sound and graphics features more quickly than any other guide. There are probably books that do a better job of explaining the theory behind Pascal, or of providing programs for specific applications. But if you're a Pascal novice, this is probably the book for you.

Practical applications

My second favorite "hands-on" Pascal book is *Pascal Primer* by David Fox and Mitchell Waite (Howard W. Sams). This text is especially useful if you have some familiarity with Basic, because the authors use the terminology of Basic to describe many of Pascal's features. A Basic subroutine and a Pascal procedure are *not* the same thing, but by seeing the comparisons between the two, the Pascal novice may develop an understanding of the language more quickly. However, it isn't necessary to know Basic to use this book.

If you need something with a recreational tint to keep your interest, check out *Apple Pascal Games* by Douglas Hergert and Joseph T. Kalash (Sybex, Berkeley, CA). For many people, a primary frustration inherent in learning Pascal is finding good code to study independently. During the past year, Sybex has published several books of Pascal programs, including one for scientists and engineers. I focus on this game book because it's specifically designed to show the novice the logic supporting each of the different programs.

Most of the games are pretty standard: *Blackjack, Life, Wumpus,* and the like. What's different is that the authors provide a game-by-game plan to illuminate some of the more interesting features of Pascal. My only disappointment with this book is that it doesn't introduce Turtlegraphics programs (the neat graphics things that Apple Pascal can do) until the latter portion of the book—and then only fleetingly. Personally, I would have preferred fewer games with slicker graphics. Perhaps that's being considered for a follow-up volume.

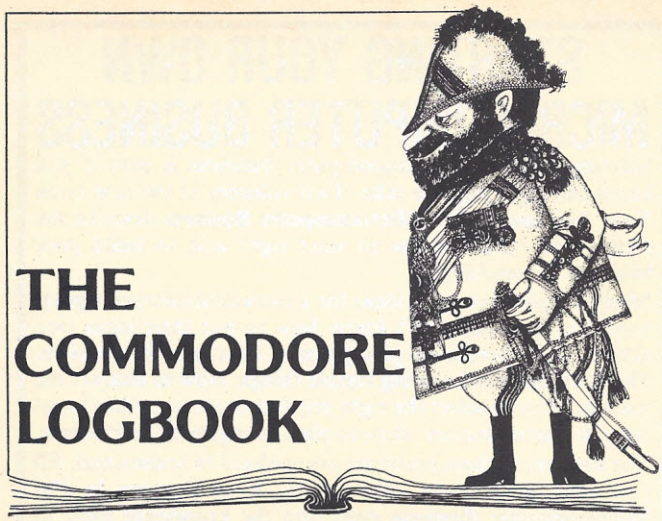
In any case, this, like the other two books mentioned, makes Apple Pascal more accessible to beginning programmers.

If you're not nurturing a teach-yourself type mentality, you can still investigate programming without pain.

An obvious move is to join an Apple users' group in your area. As more non-technical users have acquired Apple systems, many of the users' groups have made a greater effort to comply with their special needs. The San Francisco Apple Core, for instance, offers beginning and intermediate classes in both Basic and Pascal. For the location of a user group near you, write to the International Apple Core, Box 976, Daly City, CA 94017.

Many user groups have computerized tutorials of different languages, so you can let the computer do the teaching. Apple itself offers a program called *Hand Holding Basic* that is a complete computer-assisted course in programming. Another Apple program, *Apple How To!*, gives an introduction to some of the principles of Basic and assembly language programming.

There's always the option of personalized instruction, either through a junior college, adult education program, computer dealer or private teacher. The major advantage of following this final route, of course, is that training can be customized to fit individualized needs and interests. The major disadvantage is high cost. But if you're going to be a star . . . what price fame? □



THE COMMODORE LOGBOOK

by Mike Heck

CP/M on your Pet

What would be your reaction if you were offered a way to multiply the applications available for your Commodore system ten-fold, have access to many high-level languages such as business Basic, Fortran, and Cobol, plus have expanded user memory and a number of advanced hardware interfaces...all at the same time? You would probably assume that this pushes things too far—especially on a microcomputer.

However, these capabilities can be a reality by using a simple hardware add-on for the Pet or CBM, which allows use of CP/M.

Let's examine CP/M and how its power can be applied to Commodore equipment. One of the problems with microcomputers—in fact any computer—is that each is governed by a unique set of commands. Yet at the lowest level, every computer must perform the same tasks: get data from the keyboard, print information and handle disk activity. These tasks are usually handled by a "manager" referred to as an operating system.

On the standard Pet, a combination of Basic and DOS (Disk Operating System) initiate these activities. If you're just using Pet programs, everything's functional, but what happens if you want to apply a program designed for another system? For the most part—tough luck. Without extensive modifications, an alien program will rarely run on a different system than it was designed for.

Fortunately, in the early days of microcomputers, this problem of incompatibility was addressed, and CP/M was born. CP/M is popular because all the hardware dependent parts of CP/M are put in one part of the program. A developer can change just those portions of CP/M involving specific hardware—without touching the main application. Since no modifications are required to the main program, it can be used by any system capable of running CP/M.

In the seven years that CP/M has been around, thousands of programs have been created to run under it, written by more than 100 companies. Applications range from languages including business Basic, Fortran, Cobol and Pascal, and development utilities like assemblers, to accounts payable/receivable, data bases, planning and word processing applications.

Two CP/M hardware requirements are not met by standard Commodore equipment. CP/M was originally designed around an 8080 microprocessor. Since the Pet contains a 6502—whose instruction set is not compatible—a different microprocessor must be added. The system must also have at least 48K of user memory.

The way to comply with these needs is through a hardware add-on that provides a Z80 microprocessor and additional user memory (RAM). Two hardware devices that give Pet/CBM systems CP/M capability are the Z-RAM card from Madison Computer (distributed by Computer Marketing Services, Cherry Hill, NJ) and the Softbox from Small Systems Engineering, Ltd. (London, England).

Physically, Z-Ram is a separate card containing two Z80 microprocessors, a 6502 processor and 64K of additional RAM. The card is designed to fit inside the top of the Pet enclosure, directly under the monitor. Four mounting screws make installation a snap.

Z-RAM is designed to work with either a 40-column Pet or 80-column 8032 system. The advantage of using the 8032 is that most CP/M programs were originally designed to support 80-column terminals.

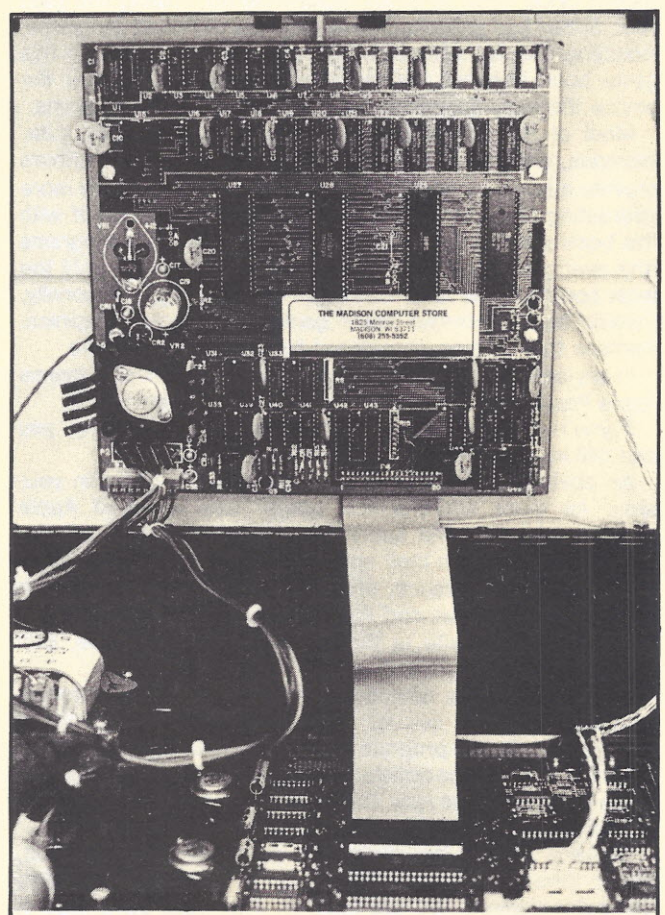
The only electrical connections involve unplugging the power cable to the main Pet motherboard, and connecting this cable to the Z-RAM. Another cable brings power from the card back to the Pet. The final connection involves removing the 6502 microprocessor from the Pet's main logic board and attaching a 40-conductor cable from the Z-RAM card to the 6502 socket.

Even without firing up CP/M, the Z-RAM permits use of the additional 64K RAM from the normal Pet. Under CP/M you have the full 64K RAM work space also.

In using this extra RAM from the Pet, you can split memory to accommodate three programs simultaneously. The first bank contains 26K RAM, the second and third 32K RAM. This is advantageous for large programs since the wait induced by going to the disk to bring in the next part of the program is eliminated.

Z-RAM supports printers either through the standard Commodore IEEE-488 interface or through Madison Computer's McTERM standard RS-232 serial port.

To use CP/M with Z-RAM, just boot the supplied CP/M disk. After a brief wait—CP/M is a short program—the opening message will be displayed along with the CP/M ready



Madison Computer's Z-RAM card

Small Systems Engineering's Softbox

prompt. Another side note: CP/M is not the most efficient with disk space. Using Commodore's 8050 disk with a total of 500K bytes on a diskette will yield a more effective operating environment.

The Softbox takes a slightly different approach to the hardware, but still provides a good CP/M implementation. Electronics are enclosed in an out-board box that can be placed anywhere near the Pet. The Softbox is attached via a standard Pet interface cable daisy-chained off any CBM peripheral. A power cord goes to an AC outlet, and that's it. The Softbox has three indicators on the front panel for power and the disk drive in operation.

Internally, the Softbox contains 64K bytes of RAM and a Z-80 microprocessor. Interfaces for the optional RS-232 and Corvus hard disk drive can also be purchased. CP/M for the Softbox is supplied on many Commodore formatted disks, but the larger the disk capacity, the better.

Booting from the CP/M system disk with the Softbox powered up will automatically execute CP/M.

A number of new conventions are contained within CP/M. These are standard for all CP/M based systems—not just the Commodore implementations mentioned here. Rather than naming the disk drive units 0 and 1, which are standard with Commodore, CP/M names disks A: and B: for the first two units.

The CP/M system prompt will be A> or whatever drive you select. From this point, you can get a directory of the programs on the disk, inquire about specific information regarding a file or the disk, perform housekeeping duties such as file transfer and disk formatting, and, of course, run specific programs.

A CP/M directory will look quite different from a standard CBM disk catalog:

```
A>DIR
A: FORMAT  COM : COPY      COM : MBASIC  COM
A: PIP     COM : STAT      COM : ED      COM
A: ASM     COM : DOWNLOAD  COM : WS      COM
A: PR MENU BAS : PR PGR    BAS :
```

The standard CP/M disk supplied with both Z-RAM and the Softbox contains the support programs to perform the functions mentioned above. In addition, the standard Microsoft Basic language is included.

Looking at the directory, you can determine the type of each file by the suffix, i.e. COM, BAS, etc. A COM file is a command file, which requires you to just type the file name after the prompt and it will be executed immediately. More specifically, TYPE lists a file to the screen. STAT gives available disk space, and PIP is a file transfer utility for transferring programs from one disk to another. These are all standard CP/M utilities included with any CP/M system.

To switch drives, type B: after the prompt and the prompt will change to B>, indicating that B: is now the logged drive. If you now do a directory, or DIR, the contents of the disk in drive B: will be displayed.

CP/M also has a great printer option at the system level. If you type Control-P, the printer is automatically selected, so everything on the screen is also printed. A second Control-P turns off the printer. This sure beats having to open a printer channel and enter the other commands necessary to use a printer under Pet Basic.

A BAS file is a Basic program that requires the loading of the Microsoft Basic language first. Once that's accomplished—by typing MBasic—you can type RUN FILENAME and the program will be loaded and executed.

Once the hardware's out of the way, CP/M operates the same on any system. The real power of CP/M, again, is in the number of applications available, and the transportability of those programs.

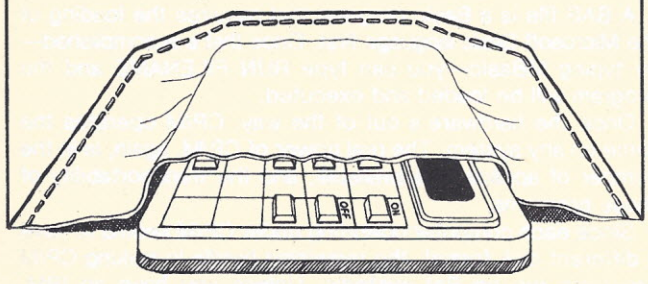
Since each computer operating under CP/M seems to have a different disk format, the remaining hurdle is making CP/M programs run on Pet systems. Unless you have an IBM-compatible 8-in. disk drive on your Pet (most CP/M programs were first distributed on that format), purchase programs already on the properly formatted CBM disk.

If you can't find the program on CBM disks, another option is to use one of the many available CP/M communication programs to transfer the CP/M applications from one computer system to another. This process involves communicating, either over phone lines or directly, between a CP/M host system and the Pet.

Once files are transferred from the host system to the Pet, they are saved on CBM disks. Though this may seem like extra effort—in some cases it is—the work usually pays dividends through access to an expansive base of CP/M programs. In the same way, learning about CP/M will also pay off due to its simple, direct operation, expanded capabilities such as hard disks and networking, and the high-quality software available. □

POWER IN YOUR POCKET

by Bob McElwain



Build a Cost-of-Living Index

Only economists can truly understand the various indexes that affect our lives, and economists don't always agree. Regardless of what they tell us, the cost of living seems to be rising faster than the indexes. (And always faster than income.) One way to come to grips with this problem is to build a cost-of-living index.

True indexing requires weighty judgement with regard to what items to include, how many of each and where to get nationally representative prices. Then one must decide the relative strength of each item—a task for the true experts. With the accompanying program, we'll consider the fundamental elements in building a personal cost-of-living index. The objective is to establish current costs on as few items as possible so that changes in the costs of these items closely correspond to the actual total change. These original costs, which can be called base costs, will be compared to the future costs.

Some may choose to include total costs. (Exceptions might be the cost of an unusually expensive or other one-time purchases that need not have been made.) This scheme works well, although it tends to measure changes in spending patterns, rather than the real cost of living. One strong plus in using actual expenditures is that significant factors won't be overlooked.

Whether using base amounts for a few key items or total expenditures, results must be interpreted carefully. A 10% cost increase can actually be no increase at all, if a new member is added to a family or if growing youngsters destroy clothes and devour mountains of food. A 10% increase may actually represent a relative decrease if someone has bought a larger home. In short, all results must be examined to determine if they reflect changed costs, changed buying habits or both.

Assume the index is to be built around certain key items (See figure 1, Index Items.) Items chosen may be quite different, but the key to building a good index is selecting appropriate items. Those items most likely to change, particularly those for which it's difficult to control quantity required (food, fuel, etc.), should be tracked closely.

This index consists of 12 items. However, three are totals of preceeding items; 3—Housing, 7—Cars and 10—Food. Other items that might be included are car insurance, general household, clothes, other insurance or entertainment, and any section can be expanded. For example, other items under food might include frozen, canned and fresh, and dairy products are important in most families.

ITEM #	**TYPE	HEADING	BASE	CUR VAL	% CHANGE
1	0	PAYMENT	$374	$398.4	UP 6.5%
2	0	UPKEEP	94	114.0	UP 21.3%
3	1	HOUSING	* 468	* 512.4	UP 9.5%
4	0	FUEL	135	154.7	UP 14.6%
5	0	UPKEEP	47	$85.2	UP 81.3%
6	0	INSURANCE	72	$77.3	UP 7.4%
7	1	CARS	* 254	317.2	UP 24.9%
8	0	MEAT	147	207.6	UP 41.2%
9	0	OTHER	103	123.9	UP 20.3%
10	1	FOOD	* 250	331.5	UP 32.6%
11	2	MEDICAL	147	126.2	DOWN 14.1%
12	2	CONSTANT	510	522.4	UP 2.4%
		TOTAL INDEX	$1,629	$1,809.7	UP 11.1%

* Values computed and assigned on each computation of the index.

** 0 An item within a section.
1 End of a section.
2 A segment.

Figure 1. Index items

Item 12, Constant, is very important. Included in this category are as many items as possible for which costs are expected to remain constant. A house payment can be included here, but the total for housing will be distorted. Other possibilities are insurance of all kinds or the amount required to replace a car.

In focusing on any single item, it may be necessary to consider a representative product or an average of several products. Consider meat, for example. The total prices per pound of hamburger, chicken and steak multiplied by a constant approximates the total meat bill. There are many ways to derive this cost estimate, but the key is to identify a total base amount that approximates what is actually spent on meat in the base period. Further, since the computer is too

small to hold detailed information, accurate records of methods used need to be available when the program is run again.

When a base period has been established (perhaps an average of monthly expenditures last year) and base amounts have been determined so that each amount is a close approximation to actual expenditures, it's time to turn to the program.

INDEX should be executed in DEFine mode. Use SHIFT SPC to set key variables and display the menu. (SHIFT S saves data to tape and SHIFT L loads data previously saved.)

To edit or insert new data, use SHIFT N. Each item entered will be one of three types: an item (0), a section (1) or a segment (2).

It's important to enter these types as follows. (The program makes no effort to see this is done correctly.) Any heading may be an item (type 0) and there can be as many items in a

```
A = Offset to bypass program variables

B = Pointer to last element of data table in use

C = Flag: Zero if section, one if item, two if segment, a
    section without items

D = Base amount assigned to any heading

E = Current amount assigned to any heading

F = Flag:  One, if using access data table routine for
    listing.  Zero, if editing data

G = Accumulate total base for a section

H = Accumulate total current value for a section

I$ = Temporary value

J = Index to item in table

K = Logical item number

L = Total current value accumulated during computation
    of index

M = Total base accumulated during computation of index

N = Temporary value
```

Figure 2. Variables used

section as desired. But any set of items must be followed by a section (type 1). The program, when computing the index, totals items of a section and carries only the totals forward. Use segment (type 2) at the end of the table. Totals are treated by the program as sections without preceeding items.

The recommended form, therefore, is N items (type 0) followed by a section heading (type 1). Repeat this pattern as required. Place segments (type 2) at the end of the list. (Use figure 1 as a guide to proper format.)

Enter headings, type code (0, 1, or 2), base amounts and current data. Amounts do not need to be entered for section totals, as they are computed when the index is computed. SHIFT D can be used to display the entire table. Note that any item can be deleted by using a nonsense heading and setting amounts to zero. Be sure to change the heading type to zero.

Since base amounts and heading types should not be changed once the program is in use, it may be best to delete this code when base amounts and types have been entered. (Changing a base amount will generally invalidate any comparisons between periods.) Another solution is to add GOTOs to skip this code. If the routine is ever needed, it's available when the GOTOs have been deleted.

As listed, the program leaves room for 19 headings. If more headings are needed, consider deleting the menu (line 50) and the save/load statements (lines 100 and 200). Two memories are required for each item. □

Program on page 136

BRAINS-MAINFRAMES

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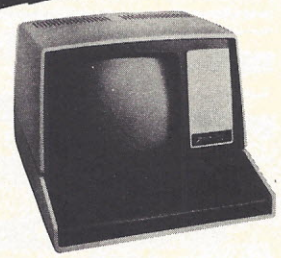

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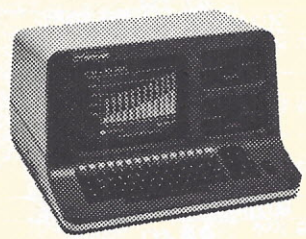

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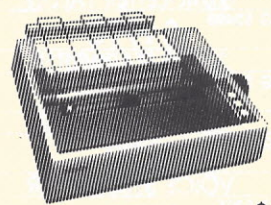

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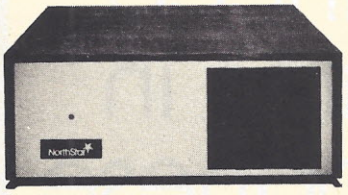

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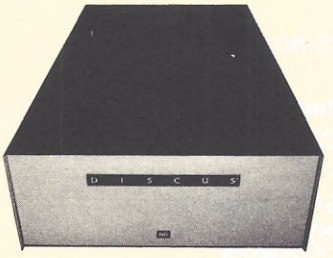

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Assignment: Benchmark

NEC ASTRA 205

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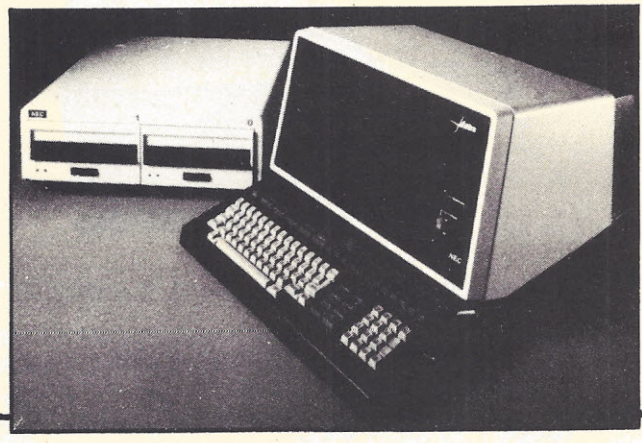

	C-3 Accounts Receivable Time (min.)	Current Price
NEC Astra 205	5:10.8	$ 9,890
Altos ACS8000-15	10:41.5	$ 9,875
Wang 2200SVP	2:23.0	$14,600
Pertec PCC 2000	6:04.3	$12,470
North Star Horizon	1:57.7	$ 6,911
Cromemco System Two	2:48.0	$ 9,275
Texas Instruments 771	3:38.1	$12,100
Vector Graphic System B	5:56.5	$ 8,995
DECstation 78	5:04.8*	$10,495
Radio Shack TRS-80 model II	3:38.6	$ 7,609
Apple II +	6:17.4	$ 4,330
Digital Microsystems DSC-2	3:28.8	$ 9,015
Ohio Scientific C3-A	15:49.3	$10,940
Alpha Micro AM-1011	3:25.3	$15,605
Data General CS/10 model C1	**	$13,400

Dynabyte 5300
Billings BC-12 DF2M
SD Systems SD-200
IBM Personal Computer

to be covered in future issues

*Result includes both compile and run time.
**Time of 2:40.3 was obtained using hard disk system.

by Hillel Segal

NEC Information Systems (Lexington, MA) now markets a full line of small-to-medium-size Japanese-made computers. The entry-level model, the Astra 205, underwent benchmark performance testing sponsored by the Association of Computer Users and conducted by the Business Research Division of the University of Colorado.

This series of tests includes systems priced under $25,000. Reported here are the results of the accounts receivable test only. This test uses both disk and processor operations, storing and retrieving information on a set of hypothetical accounts.

NEC, formed in April, 1977 as a wholly-owned subsidiary of Nippon Electric Co. (Tokyo, Japan), has expanded its systems offerings rapidly over the past several years. The products began coming to the U.S. in 1978 with first shipments of the Spinwriter letter quality printer and Trimliner band printers.

The 205 is one of five models in the Astra family, but it is the only one whose hardware cannot be upgraded to the level of the more advanced systems. Nevertheless, it is software-compatible, using the Astra operating system with Cobol or Basic languages.

The Astra series was introduced in March 1979, with a line of OEM floppy and Winchester disk drives debuting two months later. The Astra 205 was introduced in

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November 1980; as of early December about 100 units had been sold to some 50 different customers. All aspects of the system are built by NEC, from the microprocessor on up to complete operator stations, diskette and disk drives, and printers.

Key features of the systems software are a sophisticated screen-face generator for writing applications programs and a good data base management system.

System management utilities include various disk and directory functions, sort and merge, a text editor, compiler and linker. Printer spooling is available so users can begin another task while the printer is being used to generate hard copy output.

The Basic language is very Cobol-like, containing a data division in which variable and data records are defined. The langage allows easy manipulation of the screen, including selective scroll areas, underlining, prompts and checking the data as it is entered.

The compiler appeared to make extensive use of the disk for storage while it was operating, and required 24 K bytes of storage itself. The compile process appeared to be fairly slow, requiring several minutes for most programs that were tested. Compile time, of course, does not affect end users running the program, only those participating in the program development/debug process.

Astra applications software includes eight accounting packages plus word processing. The business packages are sales order processing and analysis, accounts receivable and payable, general ledger, payroll and inventory control.

Benchmark researchers examined the accounts receivable package, and said they were impressed with the care taken by NEC to create easy-to-use and error-free systems. The package was well planned, made extensive use of menus, forms fill-in, and automatic fill-in of fields, and incorporated error-checking and other features. The various business packages are fully integrated to give the user a comprehensive automated record keeping system.

Despite a 16-bit processor, the Astra was no faster in the accounts receivable test than 8-bit computers tested in this series. Run time for this test (5:10.8) was about average. The Astra uses a compiled version of Basic; compile time was about 11 minutes.

The interactive data management utility, Smart, may be used to create, update and retrieve records as well as generate reports. When used with the screen generator utility, Smart can provide extensive applications by simply defining the needed records, screen-faces and reporting formats, in response to system prompting. Business applications can be written in one-tenth the time required with Basic or Cobol, according to NEC estimates.

The system editor is a screen-oriented version with full cursor control, inserts, global search and replace, block move, etc. It makes extensive use of the special function keys for various commands.

The test system was an Astra 205 with CRT, processor, 128K bytes of memory, detached keyboard, two floppy drives (1.2-Mbyte each) and 120 cps dot-matrix printer. Total current price for this configuration would be just under $10,000.

The CRT features a 25-by-80 character green-on-black screen with reverse video highlighting, blinking fields and split-screen scrolling. The keyboard includes 27 special-function keys and a 10-key numeric pad.

Memory in the Astra 205 is expandable in 64K-byte increments to a total of 256K bytes. Diskettes may be added to realize a total of 4.8M bytes.

As the low end model in the Astra line, the 205 does not offer hard disk expansion capability. Recent memory and disk hardware upgrades announced by NEC that pertain to the models 210, 230 and 250 do not affect the model 205 at present. The newly-released Astra 270, NEC's top model, is said to be positioned next to IBM's System/38.

NEC offers two letter-quality printer models, running at 35 and 55 cps, as well as three dot matrix printers at 100, 120 and 200 cps. The model 205, however, can only attach a single printer.

Because the system is relatively new, with only about 100 installed at last report, user comments were not readily available. Of a half-dozen names supplied by NEC, four turned out to be dealers.

The end users surveyed gave the Astra 205 generally positive comments—especially in regard to the software. "Super software and very comprehensive," commented one. "In some cases it might be more software than a floppy system can use. It's got many bells and whistles." Another user commented that "inventory control is a very, very strong package."

Users are provided an extensive set of documentation on the system. This includes a business Basic notebook, with examples of how to use the system, and three primary manuals on program development facilities, utilities, and Basic programming. Other specific manuals cover various aspects of the hardware and optional software.

Our benchmarkers noted a mixed reaction to the documentation. While complete, they encountered unfamiliar terminology that made understanding it more difficult.

Hardware service is provided by NEC or an authorized independent service dealer. A maintenance contract is available from NEC. One user indicated some start-up problems, but said they had been satisfactorily resolved. General reliability and maintenance response were considered good.

Overall, benchmarkers viewed the system as a comprehensive, sophisticated unit with many programming features and considerable versatility. The uniqueness of some aspects, such as differences in the Basic language and resource management requirements (pre-allocating disk files and the data division required in Basic), could make the system more difficult for programmers to become accustomed to. But to the end user, the quality of business software is a prominent feature. Here the Astra stands out.

While NEC is a relative newcomer to the U.S. small computer marketplace, it is developing a comprehensive line of products and may be one of the first Japanese suppliers to make a significant impact here. □

Research Associate: Vic Schoenberg

Hillel Segal is president of the Association of Computer Users, a nonprofit association with members all over the U.S., Canada and several other foreign countries. A complete package of information about membership is available from ACU, Box 9003, Boulder, CO 80301.

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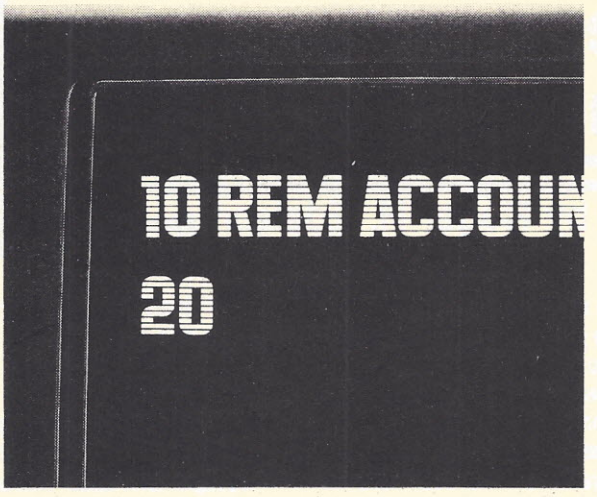

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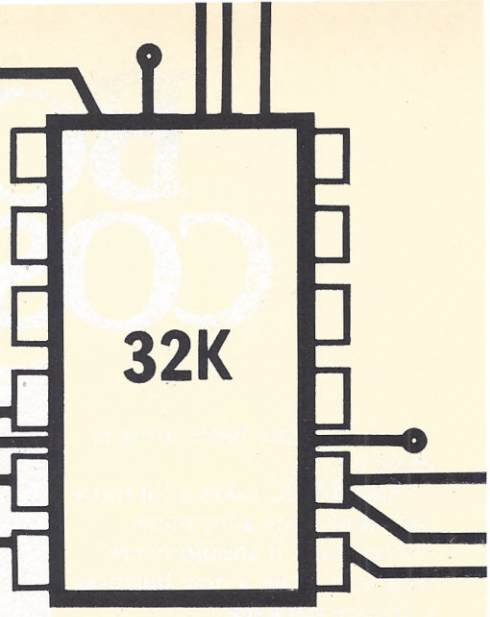
Three Non-Atari Accessories for the Atari 800



by Roger H. Edelson

As a followup to last month's review of the Atari 800 system, let's take a look at three products manufactured by other companies but useable with Atari machines to enhance their capabilities. While Atari provides a listing of programs available from non-Atari companies and programmers, the company does not promote the same acceptance of non-Atari hardware. Therefore, use of these accessories is not sanctioned by Atari and may void your warranty. How Atari could determine that you have plugged in an unauthorized card or connected a non-sanctioned peripheral is open to speculation, but consider yourself warned. We have used each of these accessories and experienced no problems with—or damage to—our Atari 800.

The 32K-byte RAM unit from Mosaic Electronics, (Oregon City, OR) provides an economical method of expanding the random-access memory space of the 400/800 computers to the maximum 48K-byte capacity. It costs less, and dissipates less heat than two 16K-memory boards. Replacing at least two memory cards, the Mosaic board leaves one slot available for expansion in the 800 system. Because of the use of low-power memory elements, it does not overload the computer power supply. The 32K RAM board is accompanied by full documentation for installation into an Atari 400—a process that requires no soldering, and minimal mechanical aptitude. Installation in an 800 model only requires opening the interior metal cover, inserting the board with the non-component side facing the keyboard.

The device uses high quality 4116 dynamic RAM integrated circuits—each storing 16K bits—to provide the full 32K bytes of storage. The board is well designed. It has gold-plated edge-connectors for added reliability and adequate capacitor bypassing to assure low-noise performance. The printed circuit board is not mounted in a plastic housing like the Atari modules, but this does not handicap usage—and may improve heat dissipation.

The Mosaic board is designed to take advantage of the Atari bus structure by incorporating proprietary board-enable circuitry. It may be used with 8K or 16K memory boards in either of the first two memory spaces. One further advantage of the Mosaic design is that with the addition of an inexpensive companion card, the module may be used without additional RAM boards. The Atari 800 memory configuration diagrams acceptable for this module are shown in the accompanying figure.

Using the board is uncomplicated; just unpack the card and plug it in. Using any of the allowable memory configurations, the card is inserted with the non-component side towards the keyboard. Then the door is closed, followed by the cover, and the computer is powered up. Once in place, there is no discernible change in screen clarity, indicating the board does not excessively load the power supply or the system bus. If you are suspicious, operation of the 32K RAM board may be verified by entering "PRINT FRE (0)". If everything is correct, the response will be a number greater than 29,500. If problems are found that can't be solved by repeating the installation procedure, return the board to Mosaic; the company will test, repair or replace it free of charge. This guarantee extends for four years from the purchase date—a high tribute to conservative design practice and high quality components.

For those who want still more memory, the Ramdisk from Axlon, Inc. (Sunnyvale, CA) provides 128K bytes in one package. The Ramdisk is designed to operate only with the Atari 800 and either two 16K-RAM boards or one 16K- and one 8K-board. The unit is organized as eight 16K-segments. It may be used to increase the RAM address space (through bank selection techniques) to a maximum of 160K. When combined with the proprietary Memory Management Software (MMS), the Ramdisk can function as an electronic disk.

Since the disk may be used as eight separate 16K-segments all occupying the same memory addresses (4000H to 7FFFH), probably the most innovative use of all this memory would be in the field of graphics and animation. One can visualize a system that instantly switches from one memory segment to another, allowing immediate transition from screen display to another stored screen. This bank switching technique is much faster than altering the Atari display list to obtain the screen information from a different location. Even more spectacular effects are possible by changing from memory bank to memory bank in the middle of a screen.

In most cases, no memory management program is required to facilitate the above memory switching. The memory segment in use is selected by writing the segment number (1 through 8 in binary) to any address

in the range of either OFCO-OFFF(hex) or CFCO-CFFF(hex). The last three bits of any data written to these addresses selects the memory segment to be active. As there are only eight segments that can be selected, the segment number written to the controlling addresses is actually modulo-8—in other words B4(hex) and 04(hex) will place the same memory segment, number 4, at the addresses 4000(hex) to 7FFF(hex).

As mentioned, either of the two addresses may be used as the control locations for memory bank switching, but as the Memory Management Software also occupies the address space OFCO-OFFF(hex), it is suggested that when you write programs that operate with the MMS, you avoid these locations and only use the CFCO-CFFF(hex) addresses. Attempting to use the bank-select memory organization with Basic—but without the MMS—is probably not workable. When performing the POKES that affect the segment switching, the result will likely shift the memory segments in which the operating Basic program was stored into inactive memory.

Extraordinary application

While treating the Axlon Ramdisk as a bank selectable memory is conducive to some interesting applications, probably the most fascinating use of this memory is as an electronic disk. In this application, the Ramdisk, operating in conjunction with the Memory Management Software is on the order of 20 times faster than a mechanical disk, and is fully compatible with existing Atari 800 software. In fact, when the operating system boots up with MMS, the Ramdisk is assigned as Drive 4, or D4:. This increased disk access speed lends itself to the sorts and data management functions required by a mail list program. Another time-saving use for the Ramdisk emerges through the production of multiple copies of the same disk. The electronic disk reduces by a factor of two the time needed to transfer disk contents, or just files, to the copy floppy disk.

There are, however, a couple of minor disadvantages associated with the Ramdisk system—you must take the time to load the disk at the start of a session with your computer, and there is some overhead (both time and memory locations)—associated with MMS.

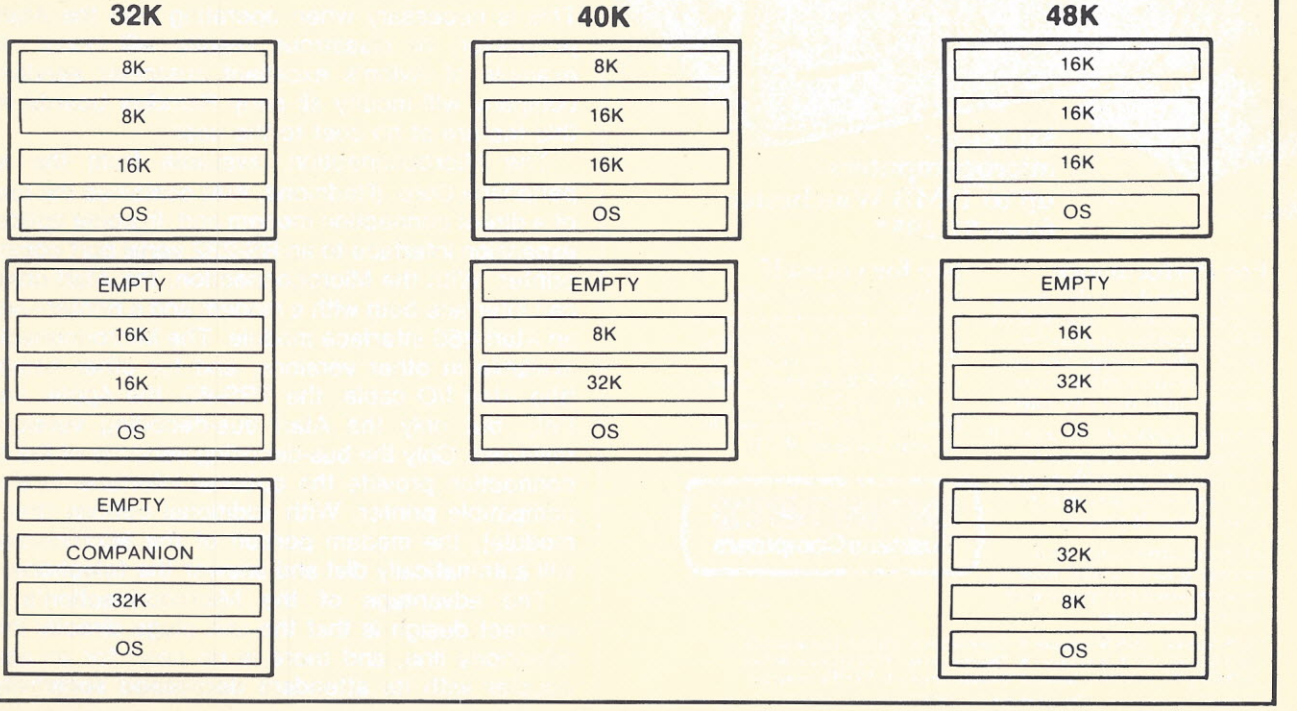
To use the Ramdisk as an electronic disk, it is first necessary to create an operating system that combines the Atari DOS 2.OS and the Axlon-supplied MMS. The MMS disk is *not* supplied with the Atari DOS 2.OS. You must already own this disk operating system. If this requirement is met along with the requisite memory—either 2-16K boards or 1-16K and 1-8K board—you are ready to go. Open the circuit board cover of the Atari 800, insert the Ramdisk printed circuit board in the slot between the two RAM cards (the side that says Ramdisk on it should face forward, towards the keyboard), close the cover and power up.

Axlon supplies a CREATE program for ease in generating the complete Memory Management Software that incorporates the Atari DOS 2.OS. It is not absolutely necessary to use this program to generate the Memory Management Software, but without using CREATE, you must thoroughly understand the Atari DOS. When you ran the CREATE program, it will interactively guide you through the procedures and will place the following files on the final disk:

DOS.SYS
DUP.SYS
AUTORUN.SYS

The first two files are the part of the standard Atari DOS 2.OS, and the autorun file contains the Memory Management Software. Since autorun files are loaded automatically whenever the disk is booted, you must not place these files on a disk already containing an autorun file. If it is necessary to have additional AUTORUN.SYS files on the disk, these should be appended to the MMS autofile, which can be accomplished by using the DOS COPY function with the APPEND option "/A".

MEMORY CONFIGURATION DIAGRAM



Besides the CREATE program and the AUTORUN.SYS file, Axlon provides four other useful programs on the floppy disk included with the Ramdisk:

ASSIGN—	Allows selection of a different default assignment of the RAMDISK (normally D4:).
RAMSCAN—	Memory test program
MEMTEST—	Another memory test program
NOMEMSAV—	Alters the normal MEM.SAV capability of DOS
RAMDISK.DOC—	A copy of the RAMDISK manual, ready to print.

Again, the Axlon-supplied disk does not contain Atari DOS 2.OS and will not boot by itself without using the CREATE program.

The Ramdisk utilizes 64K dynamic RAM chips. In my unit, these are Motorola MCM6665L20-integrated circuits, which have a typical access time of 200 nS and very low power requirements: only 275 mW per 16K chip for the active memory locations, and less than 200 mW for the circuits that are in the deselected, refresh-only mode. The 128K Ramdisk actually requires less power than two 16K RAM modules, and therefore will not overload the computer power supply. The board is well-built, gold plating is used on the edge connectors for increased reliability, and there is a semi-plastic case that makes it appear similar to a standard Atari module. Sufficient filtering is provided by the use of a 0.1 ufd capacitor to bypass the power and ground line at each of the 16 memory chips. The result is no on-screen or bus interference. The Ramdisk comes attractively packed inside a three-ring binder, which also contains a 15-page manual. It is backed by a relatively standard 90-day warranty against parts and workmanship. The increased speed of disk I/O and the versatility of bank selection make it a very attractive choice for a second disk drive.

We were recently informed by the company that a revised model Ramdisk board is now available, which includes a switch to disable the bank selection feature so the memory will mimic a standard 16K-byte board. This is necessary when operating with the Atari text processor, or disastrous results will occur. As an example of Axlon's excellent customer service, the company will modify all early Ramdisk boards to add this feature at no cost to the user.

The Microconnection, available from the Microperipheral Corp. (Redmond, WA) combines the features of a direct connection modem and, in some options, an expansion interface to an RS-232 serial port compatible printer. With the Microconnection, the Atari computer can interface both with a modem and a printer—without an Atari 850 interface module. The Microconnection is available in other versions, and for other computers (the Atari I/O cable, the TRS-80, the Apple, and the Pet), but only the Atari bus-decoding version was reviewed. Only the bus-decoding versions of the Microconnection provide the optional interface to a serial-compatible printer. With additional options (the Automodule), the modem portion of the Microconnection will automatically dial and answer the telephone.

The advantage of the Microconnection's direct connect design is that the unit plugs directly into the telephone line, and there is no need for an acoustic coupler with its attendant decreased sensitivity and

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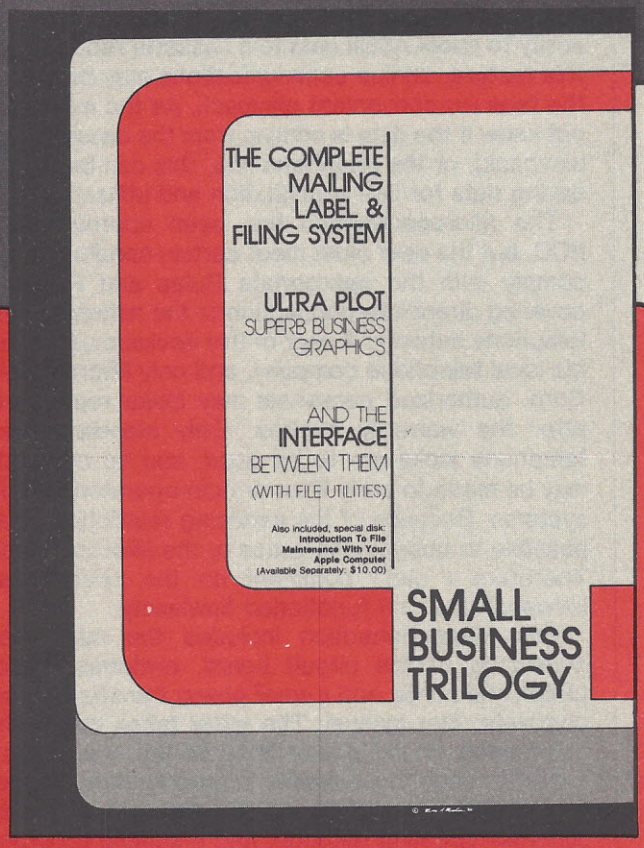

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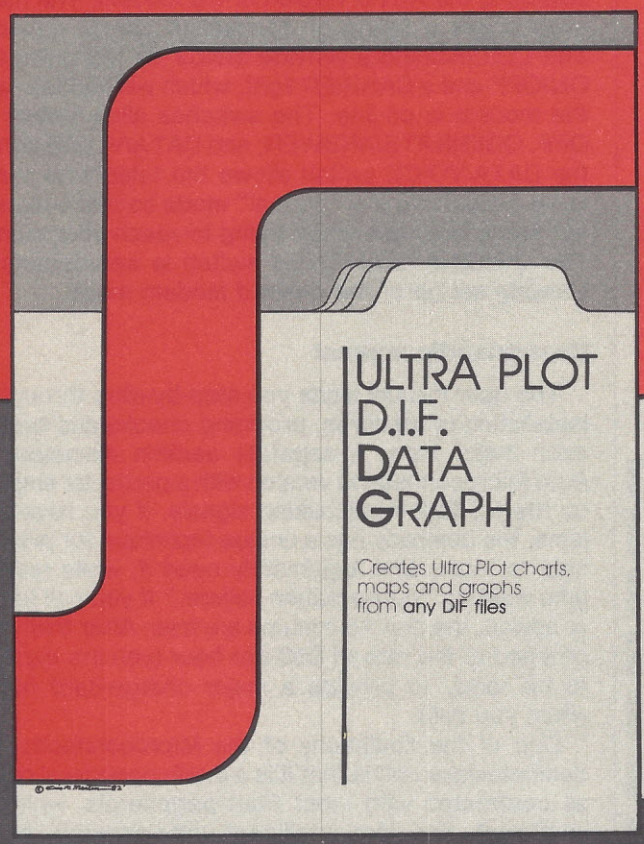

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increased bit-error rate. Further, a direct connection modem is not subject to ambient room noise conditions—nor does it intrude itself by producing an audible whistle. A unique feature of the Microconnection is its ability to spool ASCII data to a cassette recorder. Using this feature, on-line communications may be stored on the tape for convenient playback. As the modem does not know if the data is coming from the cassette (during playback), or the telephone line, this can be useful for saving data for late examination and utilization.

The Microconnection has been approved by the FCC, but the user must meet certain conditions to fully comply with the appropriate Rules and Regulations covering direct interconnection to the national switched telephone network. A user of this device must so advise his local telephone company, and only Microperipheral Corp. authorized personnel may make repairs—even after the warranty expires. Only standard modular telephone jacks are to be used, and no connections may be made to party lines or coin-operated telephone systems. Because of the servicing restriction, it is not possible to obtain schematics of the Microconnection. Therefore I can't comment on the circuit design. However, the unit functioned flawlessly.

The Microconnection includes the main module consisting of the circuit board, switches, indicator LEDS, and cords, and a small power transformer, plus a complete user manual. The latter takes you from the connection of the power lines to the line-plug/transformer through the complete interconnection procedure. It describes the AUTO feature, the use of the tape-recorder spooling function, and a sample program for initializing the AUTO version of the modem. The manual even offers a listing of compatible dial-up networks. The LED indicators provide status on the unit power ON/OFF and a CARRIER light, which will indicate when the modem is on-line. The switches allow power ON/OFF, ORIGINATE/ANSWER, and DATA/VOICE control; the DATA/VOICE switch allows the telephone system to be placed into the "normal" mode so that callers will not find a busy line when trying to reach your number. The ORIGINATE/ANSWER switch is self-descriptive, allowing set-up of the desired modem mode.

User-friendly manual

The user manual leads you step-by-step through the installation procedures, providing checks and tests for each major item. A separate section discusses the Auto Microconnection version with a particular emphasis on the RS-232 handshaking signals. If you have problems, the company has a unique technique for providing help to those who legitimately need it, while reducing time wasting "conversation callers." If you call for help or advice, the first 15 minutes are free. After that you're charged at the rate of $50 per hour (you are expected to be ready to provide a major charge-card number when you call).

One of the limitations of the Microconnection modem/interface unit is that it is a dumb peripheral device, as contrasted with most Atari peripherals, which are intelligent. The Atari intelligent units generally contain their own microprocessor for greater flexibility. The Atari peripherals are always ON and are addressable from the computer. This unit will respond to any signals on the I/O cable, even though they were intended for another peripheral. Because of this limitation, the

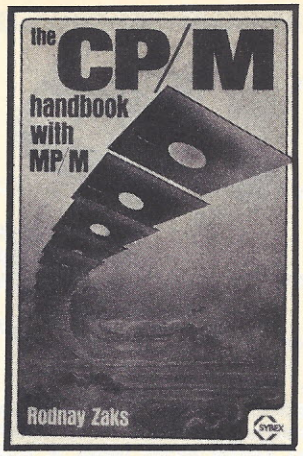
Microconnection can interfere with the computer's I/O to another device and it is possible to destroy diskette information by attempting to perform normal disk I/O operations while the modem is online. Therefore, if you are doing input/output to the Microconnection, it is necessary to close the modem IOCB before you perform any input or output to another device. This limitation only applies to external devices connected to the Atari home computer system through I/O cables, and does not affect operation of the keyboard, screen, or screen editor.

To make the product even more useful, the company offers two programs—TSmart, a smart terminal program, and Typer-A, which allows the Microconnection to be used as an RS-232 interface between the computer and serial devices such as an Epson printer. Both of these programs are supplied on tape cassettes, which are easily transferred to disk. Typer-A eliminates the need for the Atari 850 interface module to operate a non-Atari printer by making the Microconnection into a standard Atari peripheral device. It does this by providing a new symbolic device name—M:, and if the program uses a LIST"M:", PRINT #iocb, or PUT #iocb statement, the output will go to the RS-232 port on the Microconnection. If a serial printer is connected to this port, the program output will be printed. If the VOICE/DATA is in the DATA position, an OPEN statement for device M: will cause the phone to go "off hook" and the earlier statements will cause the program output to be sent over the telephone line.

The Microconnection has been approved by the FCC, but the user must meet certain requirements

The TSmart program permits transfer of Basic programs between a remote host computer and an Atari cassette or disk storage device, allowing off-line text preparation with a text-editing program for on-line transmission. TSmart support the autodial feature if the user has the Auto-Microconnection version, and a built-in feature permits creation and storage of text—then transmission by TSmart for those without a text editor. TSmart also recognizes the automatic buffer open/close (X-ON/X-OFF) codes. An AUTOBUF feature will open and close the memory storage buffer when uploading or downloading. The program is particularly friendly in its operation with bulletin boards. It will automatically download from Forum-80 boards, and is compatible with the standardized block mode and 16-line prompt recognition message entry format.

For Atari owners requiring a modem, the Microconnection provides a quality 300-baud, Bell 103-compatible unit. A full autodial/autoanswer can be added at minimal cost. Besides providing a modem superior in design to an acoustic coupler, the Microconnection also offers an RS-232 port for a printer connection. This makes the unit extremely cost-effective. □



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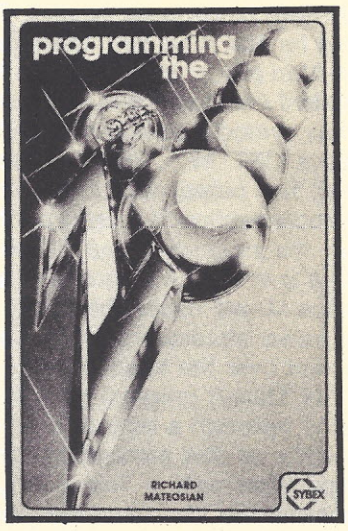

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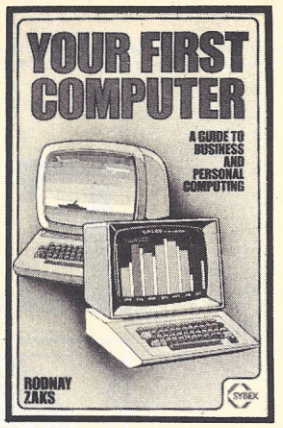

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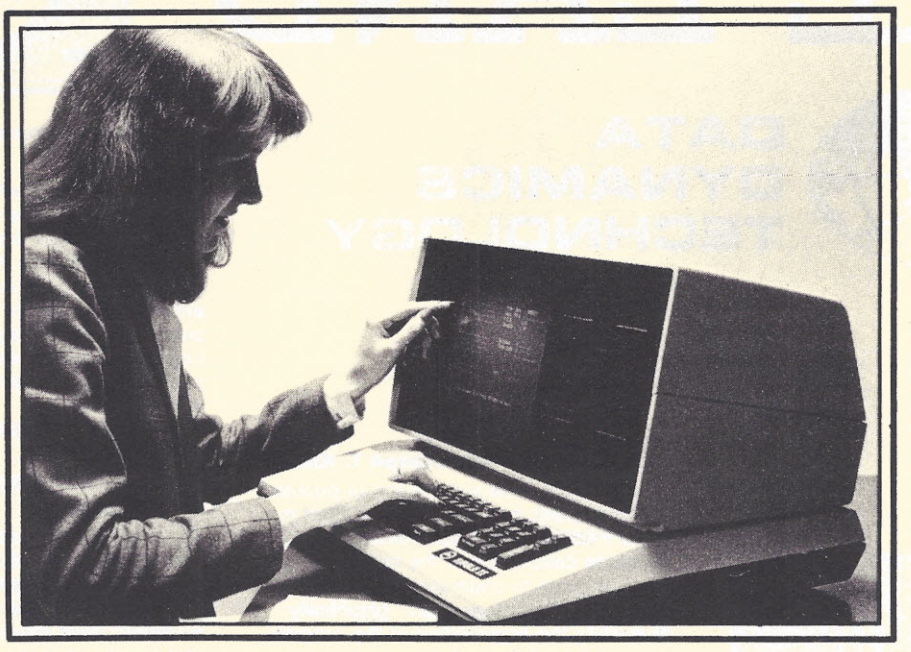
System of the Month

EAGLE II



by Tom Fox

As a manufacturer of business microcomputer systems, Eagle Computer (Campbell, CA) possesses an unlikely pedigree. Back in 1971, Eagle began life in another arena: the world of entertainment.

Somewhere along the way, Eagle (formerly AVL), developed an automated controller for banks of slide projectors. Its function is to choreograph a phalanx of flickering frames in precise time with a pre-recorded sound track. Six or more 35-millimeter slide projectors are involved, each with remotely controlled film motion and lamp intensity. Programming such a show is the labor of artists with skills like those of cartoon movie animators. It can take weeks to get the split-second timing just right in a brief 10-minute show. It's a prime task for computer assistance.

Beginning with a hobbyist-intended S-100 computer, Eagle began to build and sell increasingly more sophisticated controllers for slide projectors. The people at Eagle soon became enchanted with the power of the tiny processors and their ability to do much more than the originally conceived task.

Today, we see Eagle as a manufacturer of three related microcomputer systems—dubbed Eagles I through III. All are compact, single-piece desktop units. All come equipped with enough standard software to get a small business humming into the computer age. We selected the middle-of-the-line Eagle II for our testing. It sits smack in the middle of a highly competitive field. Let's explore what it has to offer.

"Turnkey" is the old-time computer word that seems to fit the Eagle II more closely than almost any other microcomputer in the business. Although lacking the key itself, the Eagle II is a carefully balanced package that gets up and running with a bare minimum of effort on the part of the purchaser. Here's how the first few minutes go:

1) Take the Eagle II out of the shipping carton.
2) Plug it in.
3) Insert a diskette marked DRIVE A (TOP) into the top diskette drive.
4) Turn the power switch to ON.
5) Push keys 1-6 in accordance with the menu of activities that appears on the screen.

What you see is tha main menu of the integrated accounting system. Hit the proper keys, and the computer will lead you through descending a tree of similar menus by which you command the system to do your bidding. The machine will ask you to do little that is more complicated than the steps listed above.

Compare this with the start-up procedure required by many of today's micros. Separate disk drives, terminals and video screens often need connecting.

Program and data disks need formatting and initializing. Languages (such as Basic) need to be integrated with the operating system (such as CP/M). The operating system itself may need modification, depending upon the configuration of computer and peripheral equipment. Applications programs need to be collected and made to run with the computer/operating system/language combination just assembled. All of these tasks are fraught with opportunities for mistakes. It's a chain of procedures that has bogged down more than one business person who simply wanted a cheap, simple-to-run machine for keeping track of a small company's financial condition.

An Eagle II takes the desk space of a good-sized typewriter (21-in. wide by 18-in. deep), and sits just under 14-in. tall. It appears to be divided into two pieces, but isn't. The bottom part holds the keyboard, and supports an upper portion housing display screen and a pair of floppy diskette drives.

The display screen measures 12-in. diagonally, and holds up to 12 rows of characters, 80 characters per row. The screen features the restful P31 green phosphor, and displays normal or reversed video (black letters on green background), depending upon the program being run. The wide-bandwidth (30 MHz) video monitor displays crisp, well-defined images. There is no evidence of graphics capabilities; this screen is strictly for letters and numbers.

The keyboard contains 75 keys, arranged like a lot of computers you've probably seen. The larger mass on the left forms an enhanced typewriter layout, with the block on the right resembling the pad of a desktop calculator. Many of the keys sport secondary markings on their front edges. These are for the word processing program. It's worth a note, however, that the four traditional arrow keys for moving the cursor around on the screen are missing; the calculator-style number keys perform double duty for this purpose.

N-key rollover circuitry is incorporated to keep fast typists from overrunning the input capabilities of the computer. There's a handy CAPS LOCK push-on, push-off key (mislabeled SHIFT LOCK), which disables all the lower case letters without affecting the numeric or punctuation keys. All keys incorporate IBM's "typamatic" trick: they repeat continuously if held down for more than a half-second or so. With this capability, one wonders why Eagle bothered to include a separate REPEAT key.

Twin diskette drives

The Eagle II comes equipped with a pair of identical floppy diskette drives. They accept standard soft-sectored 5-1/4-in. minifloppy diskettes, and hold 1/2M-byte of data on each of the two online diskettes. A baleful red eye on the front of each drive and rude groaning sound announce that a diskette is being read-from or written-to.

The only other manipulatable items on the Eagle II are arranged along the rear of the machine. The power ON/OFF switch is there, as is the seldom-used RESET button. The latter item is needed to re-boot the computer whenever the user makes a drastic change in programs, such as switching from word processing to accounting functions. The rear panel also supports four input/output (I/O) connectors: two serial and two parallel. The remaining item of note is a tiny muffin fan that blows a continuous stream of warm air extracted from the innards of the computer.

Beyond exterior appearance, it is the applications software that establishes a computer's personality to the end user. In the case of the Eagle II, this personality is a set of programs selected by Eagle and presented *en bloc* with the computer system. There are no choices; no add-on option list to puzzle over. The canned software comes in two pieces: an integrated set of accounting programs collectively called Accounting Plus and the Spellbinder word processing program. These programs run on top of a plain CP/M operating system that is essentially invisible to the user.

Accounting Plus is a rich, fairly complex network of accounting programs created by Software Dimensions (Citrus Heights, CA) and marketed by Systems Plus (Palo Alto, CA). The value of the Eagle II is illuminated when you realize that, in some stores, the retail price of this software is almost exactly 50% of the full price of the Eagle computer system. The accounting package includes nine major modules, many of them interrelated via common data files: point of sale, sales order entry, accounts receivable, payroll, purchase order entry, accounts payable, general ledger, inventory and system utilities.

The Eagle II sits smack in the middle of a highly competitive field

Roughly speaking, the first three programs deal with the income-producing side of a business—the next three, with the outgoing cash. General Ledger provides a method for reporting all of this activity to the business manager(s). Inventory, of course, keeps track of a company's stock on hand.

An important characteristic of the Accounting Plus package is that it is essentially unmodifiable by the user, even if he is an accomplished programmer. Written in the semi-compiled language of CBasic2, only the run-time modules are supplied. With no source code to modify, a programmer cannot make alterations. This is the main reason for the Systems Utilities module. Through this module, parameter changes unique to the installation can be conveniently altered. This includes such data as the company name, aging periods for accounts receivable and several others.

The accounting package contains all the features necessary to manage a small wholesale or retail business that sells from a stock of goods. If your business is service-related, you can simply neglect to activate the portions that deal with inventory. Similarly, cash-only firms have little need for an accounts receivable function. We can't imagine any business that could not use the general ledger, however. Those modules that are activated communicate directly with the general ledger reporting module so that the profit-and-loss statement is always up-to-date.

Lacking some of the audit trail controls of other accounting packages, this software seems ideally

suited for the situation where the business *owner* is the computer *operator* as well. See "Business Software Review" (*IA* Jun 81).

The Eagle II's other major software program is the Spellbinder word processor from Lexisoft (Davis, CA). Spellbinder is a nicely balanced package containing some advanced features that come as a pleasant surprise in a computer of this size. It offers, for example, the opportunity to define "macros"—customized combinations of command sequences that can be called up with a single keystroke. The mail merge operation is implemented in this manner. Word-breaking hyphens come in three formats: hard, firm and soft. Such fine distinctions are necessary because of the rather arbitrary usage of this character in the English language.

In the microcomputer field, Spellbinder stands almost alone in its ability to produce true proportionally-spaced printouts. Presuming that the user's printer is able to handle the task (most daisywheel printers can), this word processor will allot narrower spaces for little "i"s and give the monster capital "W" room to spread its wings.

Operations are simple

Spellbinder has been nicely adapted to the Eagle II, to the extent that 28 of the keyboard buttons carry secondary markings intended strictly for word processing functions. Operations like listing a directory of documents on a diskette, inserting or deleting text and displaying a brief "help" message are but a single keystroke away.

The Eagle II has no hardware options: There is no opportunity for the user to add on memory, I/O ports or the like. Internally, the computer's most essential electronics are spread over a single 9-in. by 14-in. circuit board. The board contains an 8-bit Z-80A microprocessor operating at 4 MHz, a full house of random-access memory (64K bytes) and the parts necessary to manage the keyboard, display screen and four I/O ports. There is mention in the literature about the possibility of adding a Winchester hard disk drive, but this would be an operation best left to your local dealer.

User documentation is consistent with Eagle's overall philosophy—heavy on the "how to use it" side, light on "why it's done this way" explanations. Two manuals are provided. The leaner of the two contains a brief 40-page User's Guide and 100-page Spellbinder manual. The other book is several times as thick, and devoted entirely to Accounting Plus applications. There is no opportunity for the user to do his own software programming on the Eagle II, so there are no manuals that would apply to this activity. Similarly, no information is offered in the area of troubleshooting or hardware maintenance.

The Eagle II, complete as described here, lists for $4,995. One would have to add a printer before the computer would be useful in its intended function. Budget from $700 to $3,500 for this item, depending upon requirements for speed and print quality. At $3,995, the Eagle I has but a single diskette drive, and omits the accounting plus package, which requires two drives for its operation. The Eagle III sells for $5,995, and is equipped with higher density disk drives for a total of 2M bytes of on-line diskette storage. Otherwise, it is identical to the Eagle II. □

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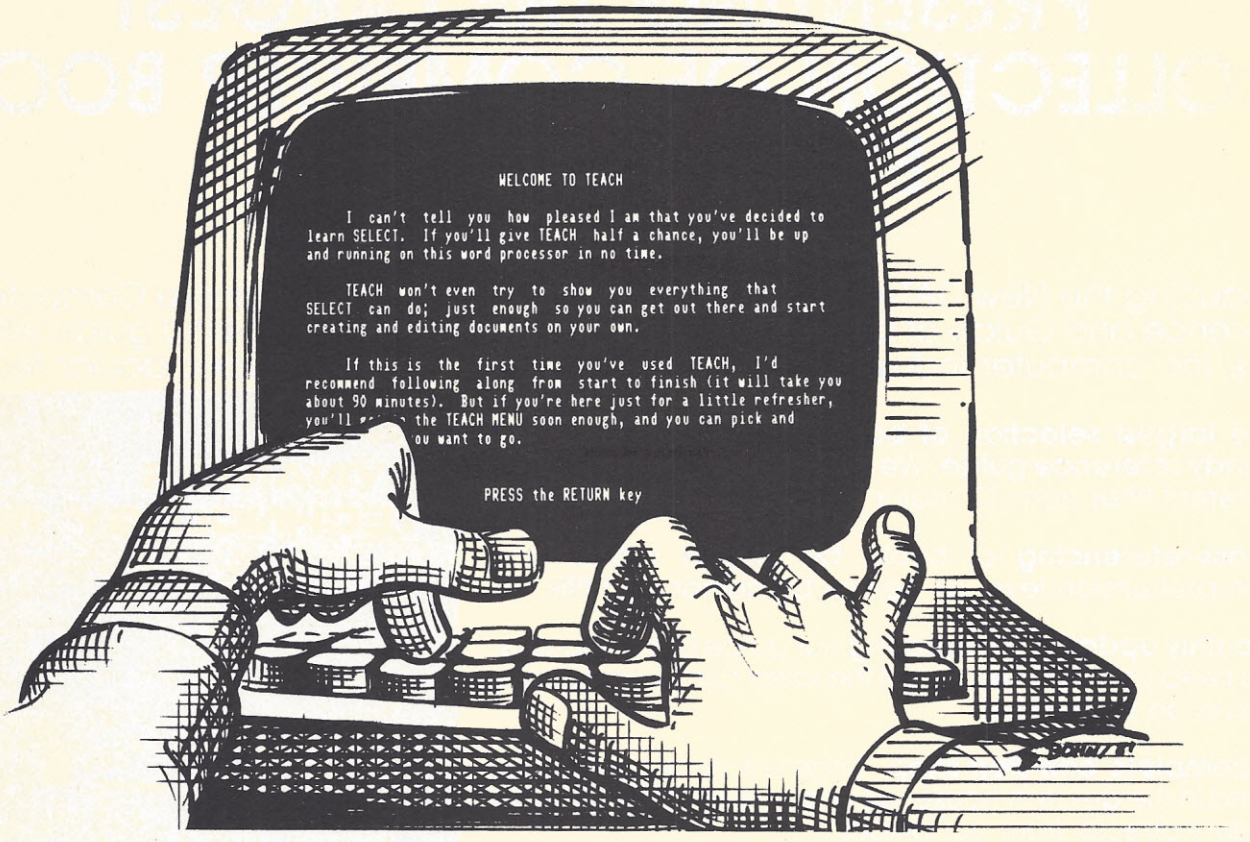

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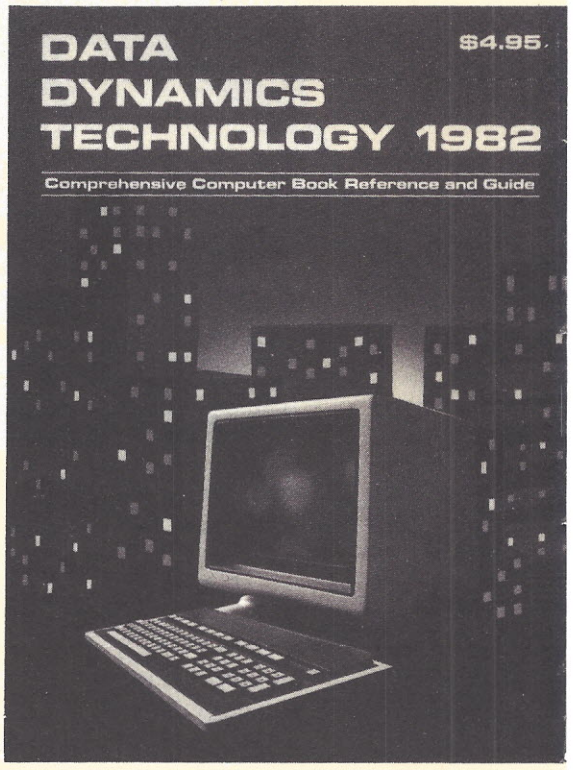

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ARTICLES WANTED

INTERFACE AGE is seeking articles pertaining to full-capability business micros for the November issue. Systems in the over $10,000 price range will be compared in an in-depth article. Additional articles should discuss both hardware and software aspects of multiuser systems and the more advanced micro systems on the market. Articles intended for this issue should be received no later than July 1 for consideration.

Other article topics being solicited include medical applications, word processing, peripherals and interfacing products, tutorials, computer graphics, communications and networking, micros in education, and the future of computers. Special emphasis is placed on business systems and applications.

Program listings should be no more than 60 characters wide, with no wrap-around lines. Unlined paper and a new ribbon should be used. Sample runs should be included. In the article text, variables should be described. The system utilized in composing the program should be detailed—operating systems, language type and version, and any necessary peripherals.

Manuscripts should be typed or printed out double-spaced with one-inch margins. Minimum text length is 8 pages, whether or not the article is accompanied by a program listing. A brief synopsis of the article should preface the manuscript. Photos should be numbered and each should have a caption. Authors are requested to submit a statement of background and expertise.

The publisher assumes no responsibility for artwork, photos or manuscripts. No acknowledgment is made unless the submission is accompanied by a large, stamped return envelope. A minimum of six weeks should be allowed for a response; it is requested that authors do not phone for information about submittals. The submittals should be addressed to: Editorial Dept., Interface Age, 16704 Marquardt Ave., Cerritos, CA 90701.

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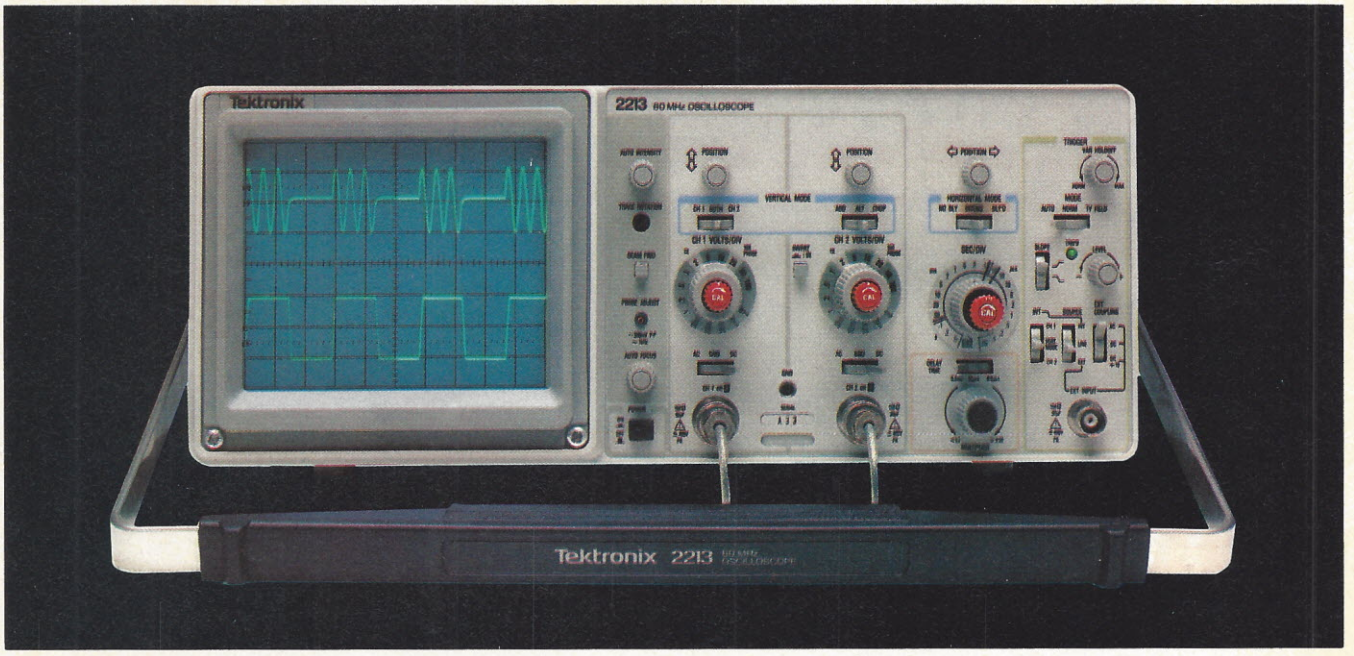

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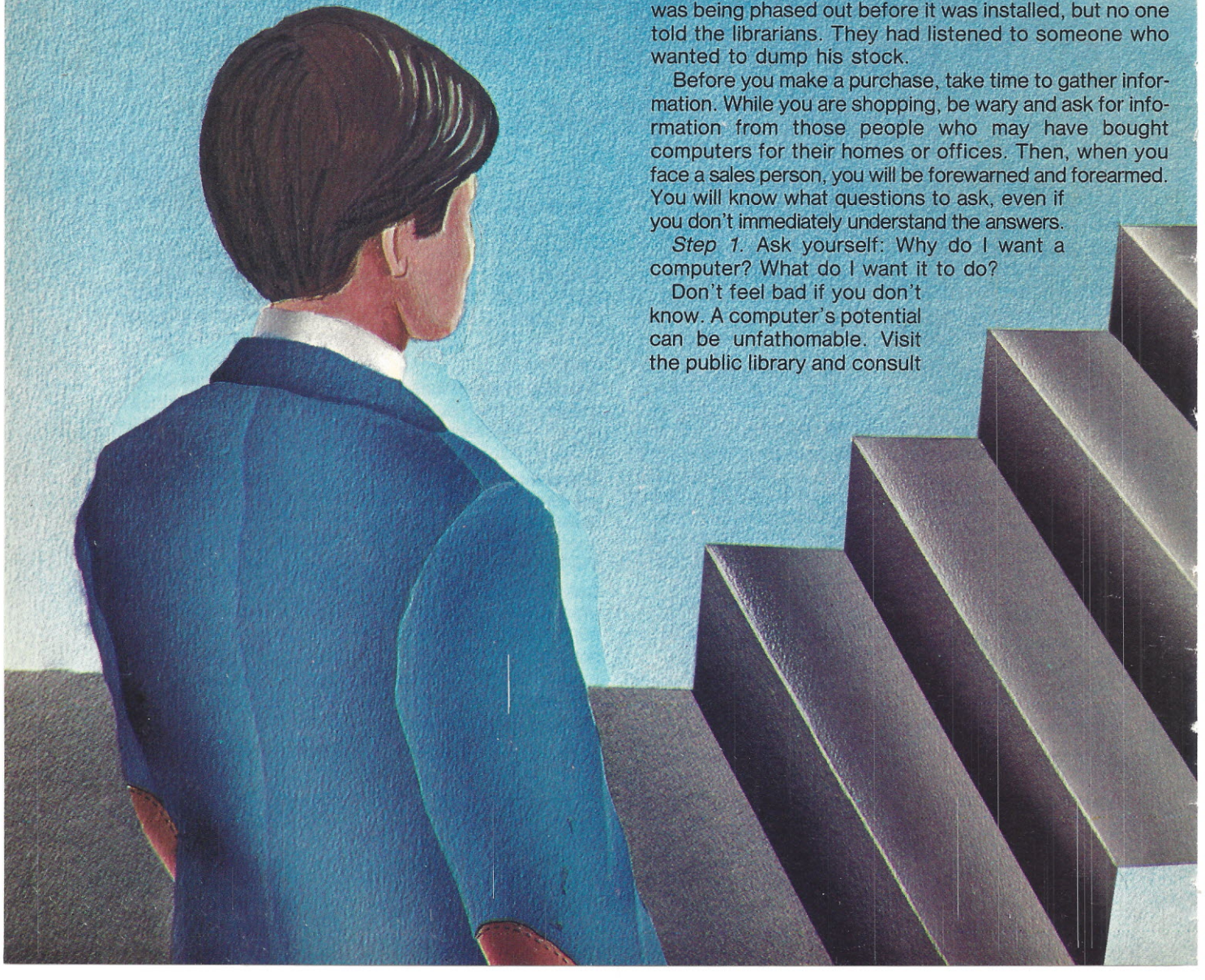


You can no longer resist. There must be something to all this talk about computers. Friends rave about them; others praise their efficiency and time-saving features in business applications. The prices have been coming down, the technology improving. It's time to investigate. But where do you start?

A session with a computer salesperson could be one of the most intimidating and sobering experiences of your life. Those with no scientific or engineering background lack a frame of reference for computer technology.

Compare buying a computer with purchasing a car. You know why you want a car and what it will do for you. You may not know exactly how the engine functions, but you know what to expect when you turn the key in the ignition and step on the gas. From past experience, your decisions may be based on features and price.

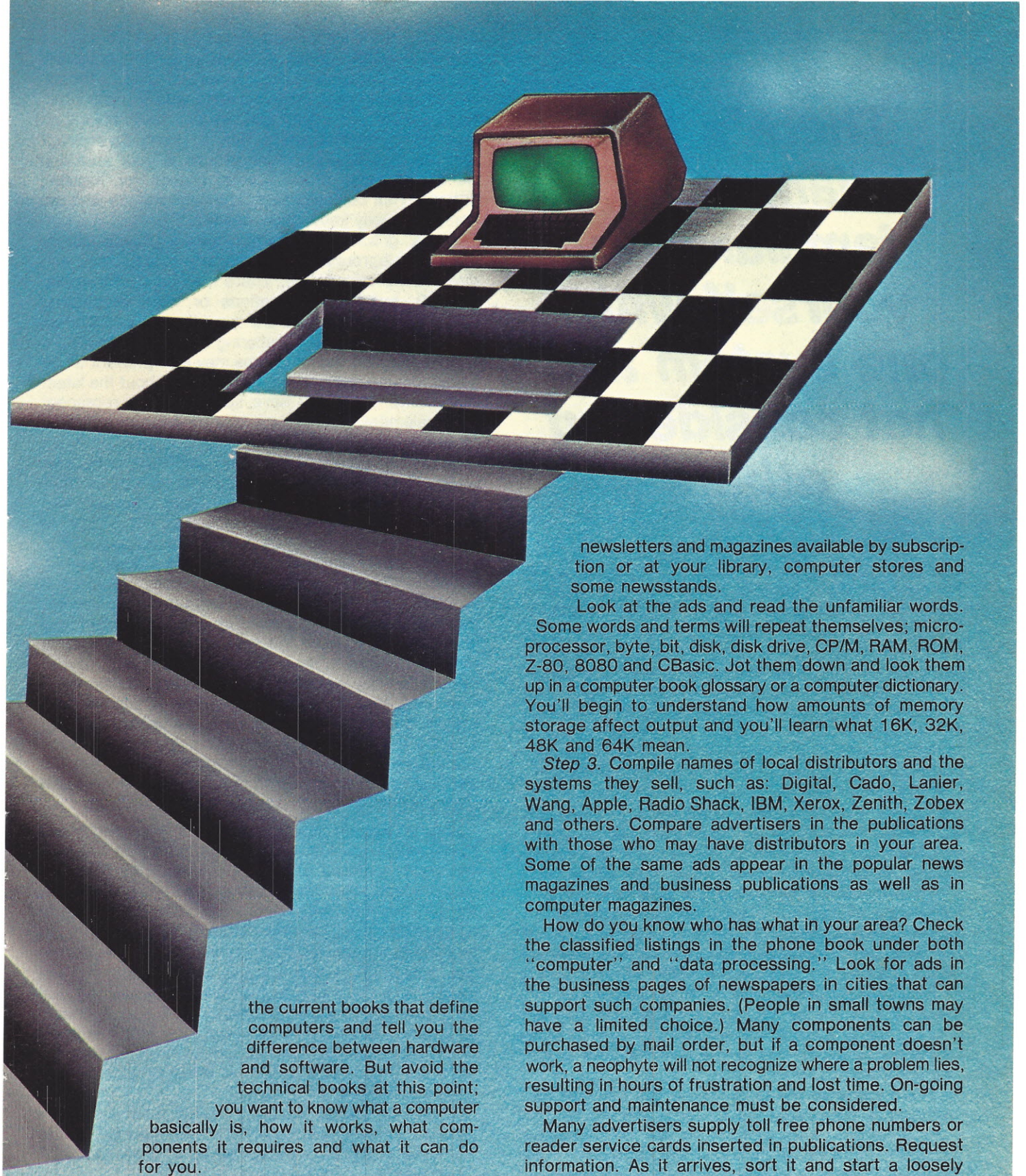
No so with a computer. You probably don't know how to turn one on and off, may have only a vague idea of what it can do for you, and that idea could be erroneous.

I was recently in a library where six computer terminals were dark and the librarians were logging books in and out by hand. The head librarian was taking the situation philosophically and stoically. A way of life with computers? It didn't have to be. That library was sold a system that was being phased out before it was installed, but no one told the librarians. They had listened to someone who wanted to dump his stock.

Before you make a purchase, take time to gather information. While you are shopping, be wary and ask for information from those people who may have bought computers for their homes or offices. Then, when you face a sales person, you will be forewarned and forearmed. You will know what questions to ask, even if you don't immediately understand the answers.

Step 1. Ask yourself: Why do I want a computer? What do I want it to do?

Don't feel bad if you don't know. A computer's potential can be unfathomable. Visit the public library and consult



the current books that define computers and tell you the difference between hardware and software. But avoid the technical books at this point; you want to know what a computer basically is, how it works, what components it requires and what it can do for you.

After you've read a little, you'll realize that a computer can be used for business applications such as bookkeeping and inventory; for word processing; for stock reports; to learn a language; to balance a checkbook; to educate children; to educate yourself; for playing games; to prepare income tax returns; to pursue an interest such as art or music, or simply as a means to help you understand emerging technology.

Step 2. There are many computer-oriented newspapers, newsletters and magazines available by subscription or at your library, computer stores and some newsstands.

Look at the ads and read the unfamiliar words. Some words and terms will repeat themselves; microprocessor, byte, bit, disk, disk drive, CP/M, RAM, ROM, Z-80, 8080 and CBasic. Jot them down and look them up in a computer book glossary or a computer dictionary. You'll begin to understand how amounts of memory storage affect output and you'll learn what 16K, 32K, 48K and 64K mean.

Step 3. Compile names of local distributors and the systems they sell, such as: Digital, Cado, Lanier, Wang, Apple, Radio Shack, IBM, Xerox, Zenith, Zobex and others. Compare advertisers in the publications with those who may have distributors in your area. Some of the same ads appear in the popular news magazines and business publications as well as in computer magazines.

How do you know who has what in your area? Check the classified listings in the phone book under both "computer" and "data processing." Look for ads in the business pages of newspapers in cities that can support such companies. (People in small towns may have a limited choice.) Many components can be purchased by mail order, but if a component doesn't work, a neophyte will not recognize where a problem lies, resulting in hours of frustration and lost time. On-going support and maintenance must be considered.

Many advertisers supply toll free phone numbers or reader service cards inserted in publications. Request information. As it arrives, sort it and start a loosely divided file; i.e.: systems, terminals, printers and software. As the file becomes larger, categories will emerge and you will be able to specifically rearrange your information. Before long, you will become familiar with components and basic features, and be in a position to compare one against another.

Step 4. Visit local showrooms and dealers for hands-on demonstrations and to discuss your needs. Explain what you *think* you want and be open to suggestions.

There's the danger of familiarizing yourself with one system and not considering others

For example, if you know you want a word processing machine, let the salesmen suggest the best programs. The time to decide what program you want to run is *before* you decide on a computer and peripherals. Some computers will not have adequate memory storage for long, sophisticated programs. (Example: one major word processing program requires 48K bytes of disk space to run, without additional space for user input.) If you bought a computer that held only 32K memory storage, you would not be able to use that specific program.)

Avoid letting anyone talk you into any system that may prove to be less than you will need, and don't be surprised if salespeople are not as helpful as you would like. Many are new to the technology and may not be as familiar as you would expect them to be about what they are selling. By this time, you'll have an elementary knowledge of the terms and products, some idea of what to ask and what some of the answers might be. If not, keep asking questions and don't be satisfied with vague answers. If a salesperson makes you feel foolish, or is impatient with you, move on to the next distributor. Caution: This is a period of possible discouragement. You may be tempted to buy whatever there is because of the overwhelming choice and your unfamiliarity with the technology. Don't.

You are now to the point where you can use your automobile purchasing background and apply it to computers. As with cars, there are no standards. Components from one computer system will not interface with another. Once you're locked into a system, you'll have to stick with it. You may attempt several connections, to interface one with another, but the resulting costs may not be worth the effort.

Go back to the books and the ads until you are sure you understand how much memory a system stores, what software your purposes require, the size and type of disks and exactly what the system will support.

Step 5. Before you make any decision about the system you may think you need, or about the dealer you will buy it from, consult your nearest computer society or users' group. A computer society is usually made up of people who use a variety of systems for any number of purposes. You can learn who is using what. Most people are willing and anxious to explain their systems to potential buyers. How do you find a society? Ask the dealers about such groups in your area and watch computer store bulletin boards for meeting notices. Your business associates and friends who run computers may know about them.

Users' groups and special interest groups usually exist as subgroups within a society to exchange and disseminate information. There may be CP/M, Apple, TRS-80, business applications or word processing users' groups. Members are committed to one system and help one another by sharing their experiences.

Societies and users' groups may also present workshops, demonstrations and discussions about the latest equipment. They may have speakers who represent the equipment in which you may be interested. When others ask questions, you will learn.

Especially important are users who have gone your route. They have discovered pitfalls, as well as highspots, and are anxious to reveal them. They will also steer you away from companies that do not support or service a unit once it is out of the store. A reputation in a computer society can make or break a company.

Step 6. Enroll in an adult education computer class, if available. Colleges throught the country have computer centers; however, enrollment as a credit student may be necessary to learn the ins and outs. But the same colleges, if they offer a business major, may have a one- or two-day weekend seminar where you can work with more than one system. Beware of schools with limited budgets; they may lack varied equipment. There's the danger of familiarizing yourself with one system and becoming so comfortable with it that you won't consider others. With this in mind, a course can offer invaluable insight into how computers work.

Step 7. You are now in a position to intelligently and realistically re-evaluate your needs. Along the way, you will have acquired some ideas about the sizes of systems and their costs. Develop a comparison chart for the systems you have seen. List the hardware components along the side. Establish headings arranged by manufacturers, distributors, number of disk drives, size, amount of memory storage, upgradable (if you can move from a single to a double density or hard disk), kind of terminal (these should be charted individually), prices, guarantees and what is covered. Log in the support offered and service contract factors, if applicable. Do the same thing for a printer or other peripherals you may be considering.

With your charts, you can compare differences and proceed to ask more questions of experienced people in the users' groups. Why is one system recommended? Or why not?

If you still aren't sure and your budget allows it, there are computer consultants. They will, for a fee, discuss your needs with you and suggest what they think is the best system. A competent consultant (finding one can be another research project) is a wise expense for a small or large business that may require interaction from multiple sources and specially written programs.

Step 8. When you have enough organized information, return to the computer stores or make appointments

with distributors for demonstrations. Evaluations may be required on your business site. When the potentials of the equipment are discussed, you will be able to speak the salesperson's language. You should ask for demonstrations of specific software you will be using. But dealers often do not have or do not know about all available software. You may have to find a software dealer and arrange for an appointment. This is one of your wisest moves at this time. Working through a software program can be a time-consuming exercise in frustration. Manuals are notoriously hard to follow, especially for a novice. You'll save time when introduced to the vagaries of a program by someone who has a working knowledge of its commands and how to use them. Often software must be configured to your specific unit before it will work.

It is also important to become familiar, through a class offered either by the dealer or an outside source, with the essential commands of the operating system built into your unit. Disks have to be copied, files have to be established. It can be overwhelming unless you're prepared for it.

Step 9. When you are on the brink of a decision, go slowly. There's a big cost factor. Decide, before you buy, on the best financial arrangement for your investment. Will you be better off with timesharing, with leasing, or by purchasing equipment outright? Check with your accountant *before* you make your decision.

An invaluable aspect of users' groups is that you can discuss costs and dealers' reputations with people who have already purchased a system. A society membership may also entitle you to a discount.

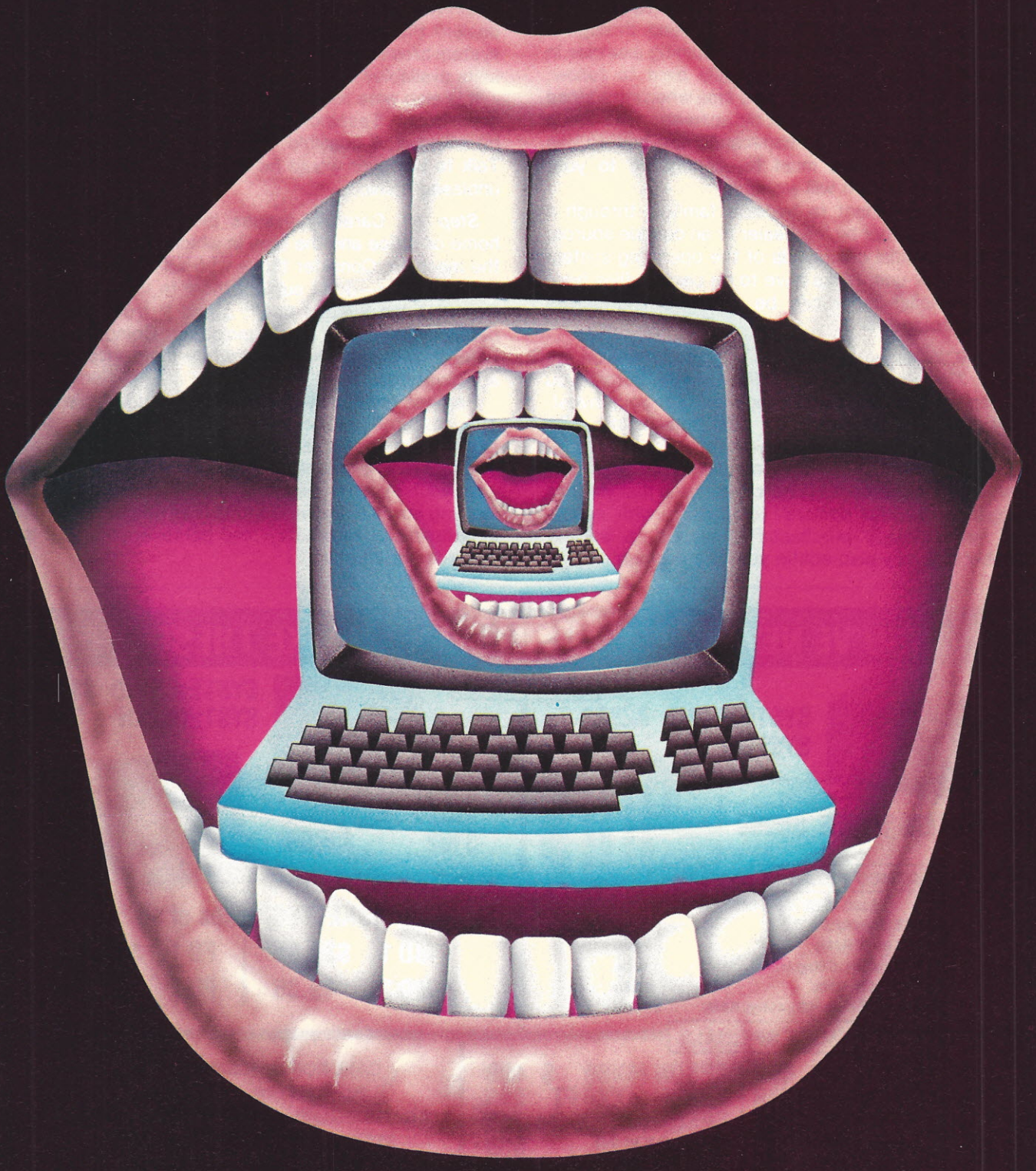
Price is where the automobile analogy most applies. You will get an idea of how you may be able to comparison shop and negotiate, depending upon the system and the competition in your area. But you must be cautious: service and support are an essential aspect of overall costs. How long is the guarantee or warranty? What does it cover? Will the dealer send a repairman to you? Will you have to bring the equipment to the dealer? Size, of course, is a factor. If a part of your system breaks down, how long will it be down? Are loan units available?

It is also wise to talk with someone from the service department. Testimonials from satisfied users should be solicited, if possible. Ask the salesman for names. Talk to whoever would be most likely to give you an unbiased opinion.

Step 10. Carefully assess the limitations of your home or office and the area in which you plan to place the machine. Consider those who will be working with the computer—don't subject them to too much glare. Consider the system itself; guard it from high temperatures and too much moisture. Computers, like other employees, work best when their environments are pleasant.

Perhaps one bonus step should be added: patience. The research outline above will require two-to-four months, depending upon the time you can devote to it. That alone is a test of whether you will be successful with your system. Learning to use a computer and learning how the software works is an on-going exercise in patience, determination and perseverance. But the rewards are plentiful. □

MICRO IDIOMS



A Look at Three Language Options

There are more than 200 high level programming languages and a staggering array of hybrid dialects available today. The criteria for language selection in a business climate must be determined by the intended application. Only by composing a comprehensive checklist of vocational requirements can language choice coincide with a particular class of problems.

For example, Fortran might provide superior mathematical qualities, but yield inadequate character manipulation for a specialized inventory control situation. Fortran is an acronym for Formula Translation, and was the first procedure-oriented tongue to achieve popularity.

PL/1 is an acronym for Programming Language One. PL/I-80 is a hybrid version of PL/1 developed for microcomputer application. Also procedure-oriented, its concise statements are similar to those of Fortran. Both Fortran and PL/I-80 are computer-independent. Either can be run on any microcomputer with the appropriate translator. This minimizes the need for comprehensive understanding of the machine and language tool—encouraging concentration on the problem.

Forth was originally cultivated for process control and wields a comparatively unique structure. Whereas Fortran and PL/1 produce machine code for direct execution by the CPU, Forth does not. Its threaded code must be interpreted, but can execute a program considerably faster than Basic. Technically, Forth combines post-fix notation with a definitional structure—permitting potential for individual customization.

Proponents of each of these three languages claim specific attributes in business application. Generally, Fortran excels in the computation-intensive programs demanded by engineering and science. PL/1 performs well in clerical tasks—particularly the grouping of records and files. Forth acts most favorably in situations requiring evaluations. All three are better suited to those with some programming experience.

The trio of articles that follow are designed to provide a more intimate exposure to these important programming vernaculars. ***—DWP***

Fortran

by Robert R. Mitchell

The computer language field is crowded. Variations of Fortran, Cobol, ALGOL, PL/I, Basic, Pascal, Forth, PILOT, C language and others are readily available from many vendors. How does a *school system* decide which to teach? How does a *hardware vendor* decide which to offer? How does a *system designer* decide which to use? Contemporary users are often bound to the manufacturer's choice. On most microcomputers, that choice is usually between Basic, Pascal, and Cobol. Fortran, an older "tongue," is seldom a focal point.

Why *not* Fortran?

Fortran is not an interpretive language. It requires compilation from source to machine language code. Linkage with libraries of specialized machine language routines to handle its many functions is also essential. Fortran does not give the immediate feedback desired for program development. It lacks the convenience of such expected input/output tools as addressable screens, prompting lines and string characters in fundamental versions.

Continued on page 140

PL/I-80

by Gary Kildall

Since its introduction on mainframe computers some 20 years ago, and more recently on minicomputers, the PL/1 language has been popular, primarily with sophisticated programmers.

PL/1 is useful because it has many of the best elements of early languages such as ALGOL, Fortran and Cobol. It has, for example, incorporated such commercial/business processing features as structures, decimal arithmetic, file processing and picture formats from Cobol.

PL/1 has its limitations, though. Redundant language constructs, little-used facilities and error-prone statement forms make PL/1 large, unwieldy and difficult to implement for less experienced programmers.

With the development in 1976 of ANSI Subset G PL/1, the General Purpose Subset, many of the drawbacks of full PL/1 were eliminated. Almost immediately, Subset G achieved widespread acceptance in the minicomputer world with implementations by Data General, DEC, Prime and Wang. With the development of the Subset G-based PL/I-80 by Digital Research

Continued on page 144

Forth

by Luigi Bisceglia

```
:X? X @ 1270 ∓ IF 0 X ! 1 S
+! ENDIF;
```

No, this isn't a shouting match between angry comic strip characters. It is a Forth language subroutine taken from the MMS-FORTH Newsletter (volume 1, #5). Though it may look incomprehensible, the internal structure is quite logical. In Basic, it would read: IF X ∓ 1270 THEN X = 0: S = S + 1.

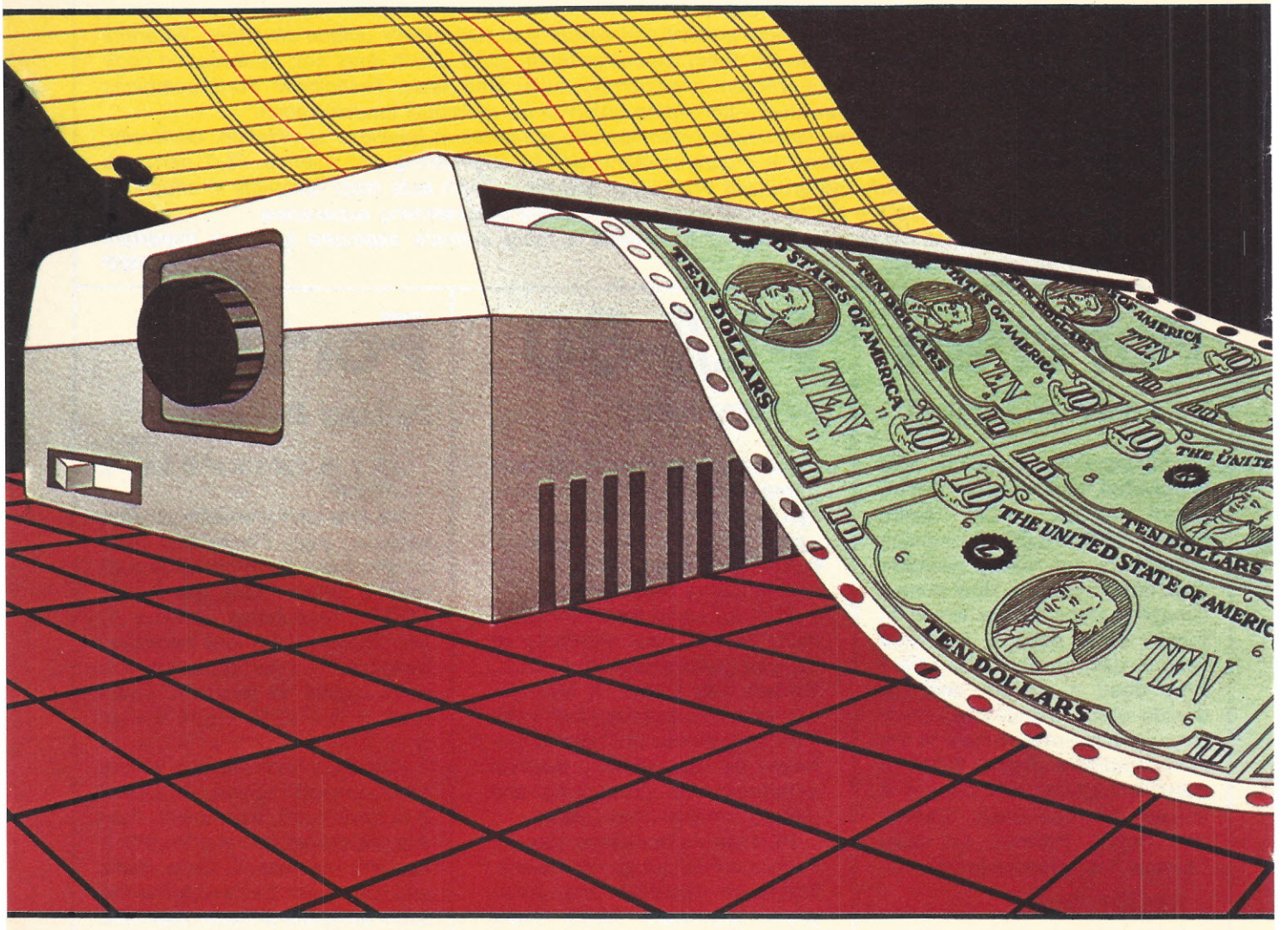
How does Forth stack up among other computer language choices? It is structured, interactive, flexible, extensible, fast and friendly. It contains the best of Pascal, Basic and assembler. Let's examine the basic structure of Forth, then take a look at some of its pros and cons.

Writing Forth has nearly the effect of writing assembler code with a high level, interactive language. Processing converses through a last-in-first-out stack using reverse Polish notation (RPN) rather than being dispersed through variables. In RPN the operators follow the operands. The algebraically formatted line (2 * (5 + 4 – 3)) – 1 could be written as 1 2 3 4 5 + * – with Forth's RPN. The solution could be visualized on a stack, as shown

Continued on page 150

Business Software Forum

SELECTING AN ACCOUNTS PAYABLE/RECEIVABLE PACKAGE



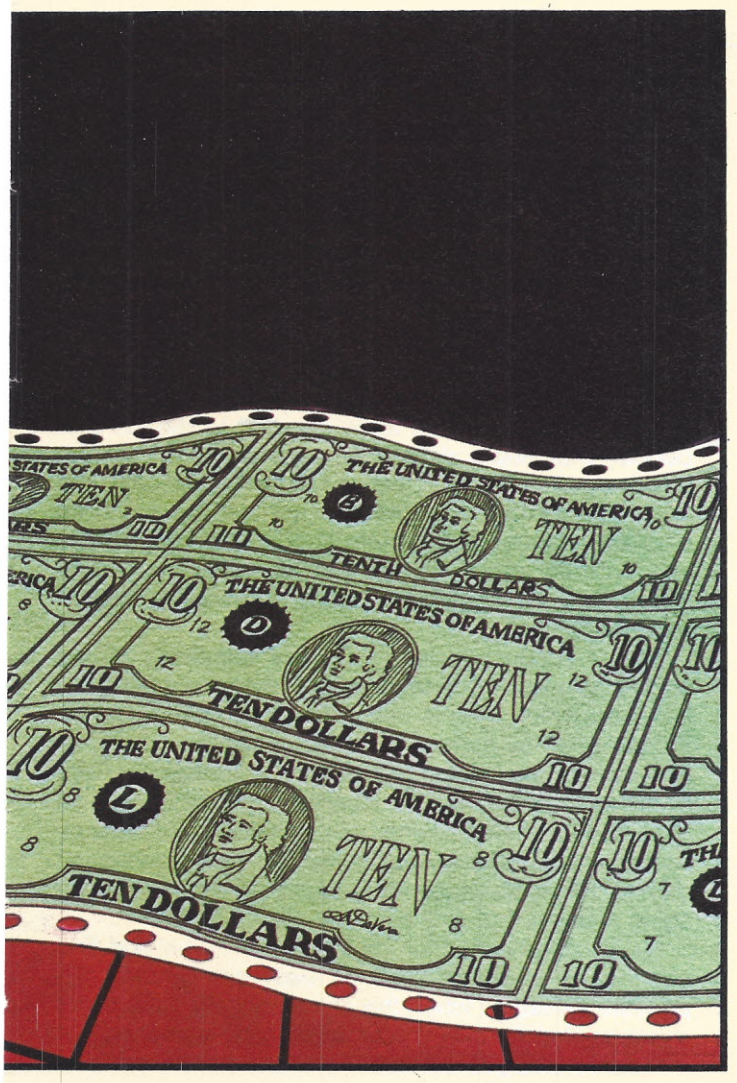
What makes up a good accounts receivable or accounts payable package? The diverse arena of requirements and many different ways in which programmers and businessmen approach these needs implies that there is no "best" program.

Elements that enter into the selection process include the limitations of a machine, the software and the attendant costs involved. All programs run better if written in machine code. But who will commit the amount of time and the prohibitive expense necessary to write machine language code for all 9,000 different combinations of micros and peripherals on the market? Who would pay the software expense for the marginal gains in speed and processing power? The selection of appropriate software becomes a matter of making intelligent *compromises*.

Let's raise the curtain on these concessions by determining some elementary functions. Exactly what is it that accounts payable/receivable programs are supposed to do? From a systems design standpoint, these are simple applications. Essentially, each has the following steps:

- create master files that contain information about customers and vendors.
- record information about sales or purchases as they occur (journalize them)
- associate journalized data with appropriate master files (index them)
- manipulate data—offset sales and cash receipts, purchases and cash payments, reorganize the data
- prepare reports that summarize the data, either by master file account, by date, or in some other fashion, such as in the form of a check-writer program

by Carl Heintz, CPA



Receivables or payables programs do essentially the same things with data, from a conceptual standpoint, and so are comparable for analysis. From an accountant's point of view, the systems are polar opposites, but from an analyst's standpoint, they are mirror images of each other.

It would be nice to be able to create the ultimate shopping list for software, but such a task is impossible. The fundamental choice of a system is contingent upon the user's desires and requirements. Before any software can be chosen, the user should evaluate his accounting system. Following are areas of primary consideration.

What is the current environment? Does the user have a computerized system, is a service bureau doing the work, or is a manual system in place?

What does the system do? A flowchart of the existing system can help to illustrate the requirements of any new system.

What is the information provided by the existing system? A list of reports should be created, especially in a manual system, for some information may be informal in nature (verbal or written on little sheets of paper from adding machine runs). What are the strong and weak points of the existing system? Why is it that a new system is necessary? What are the attributes *required* of the new system? Note that we said *required* as opposed to *desired*. Many users go overboard when creating wish lists for their micro systems.

These issues must be considered long before deciding on any particular piece of software. Without requirements, there can be no objective decision-making. The next step should be a comparative look at the features of the available software on the market, in order to find the packages most suited to your applications. While the accompanying charts represent only a sample —a dozen packages—they provide a valid starting point for the selection process. More quality payable/receivable packages will be listed in later updates to this series.

There are a number of programs in circulation—some innovative, some re-warmed versions of big-machine code. They all share some characteristics that should be scrutinized carefully.

The first consideration is the capacity. Exactly how many customers and transactions can be accommodated? The most probable determinant of this factor will be the hardware—and the disk drives in particular. Don't believe anyone who says the system he sells has *unlimited* capacity—especially if your micro has only two 100K-byte disk drives.

Look for the information maintained by the system. What kind of information is in the master file for vendors and customers? Looking at the file layouts can sometimes give a good clue as to what the system capabilities are. For example, some systems allow the user to create different classes of customers and store individual credit information. Some systems include year-to-date purchases and payments. Others even have a field for contact person, which aids in collection efforts in receivables.

One area particularly worthy of evaluation is audit trails. The importance of this hard-copy evidence cannot be overstressed—especially for a company that must supply a certified audit. A transaction listing should be automatically prepared after the information is fed.

System speed can be of primary importance in a production environment. Again, it is sometimes impossible to judge a system in anything but the user's situation. The differences in speed between disk drive units are amazing, and the size of a file can significantly affect a system's access speed. In other words, when the dealer demos the system using four or five sample records, it will probably run faster than it will after being loaded down with 200 or so accounts.

Agings produced are sometimes deceiving. Aging should be based upon invoice date

Hardware has recently taken another giant leap ahead of software with the introduction of multi-user systems. This poses a significant problem when selecting software, because most software is not really designed for multiple users. Imagine, for example, accessing the same file at nearly the same time to do different things—such as simultaneously posting sales and cash receipts. One user gets a record and posts sales to the record, while a split second later another user accesses the file and updates it for cash received. We then have two copies of the same record in memory—one that has a sale posted to it and one that has a cash receipt. When the records are returned, which one goes back into the file? Some systems have a "file busy" protocol, which prevents this sort of thing, except that it will most probably halt or lock out the second user until the first user finishes with the file. So we are back to single-user status, since both users needed the same file at the same time.

Reports and their layouts are critically important in designing an effective system. There are many alternatives available—the user should look for reports that are workable and informative. One of the most important elements in the reporting information are summaries from which accounting entries are prepared. Even in so-called integrated systems, the need for audit trails necessitates preparations and accounting summaries.

These summaries should contain all information necessary to make proper account entries. It is frustrating to add long columns of figures because a programmer forgot to include an important summary number. For accounts receivable, it is vital to have summaries by types of sales. Many companies have several different sales categories, and this information must be accurately captured. In systems including an order entry sequence, the information should be available before the receivables module gets it. Write-offs, credit memos and adjustments to receivables should be tallied separately from cash receipts so appropriate entries can be made.

The accounts payable system will generally require more detailed record keeping functions. The system should have the ability to allow checks to be coded to multiple accounts (i.e. for situations wherein one check pays a bill covering many different accounts). Ideally, a general ledger print-out indicates which checks have been charged to which accounts. There should also be summaries showing the total dollar amount charged to each account with a summary total. Even if the system updates the GL automatically, some hard-copy summary should be prepared.

For accounts payable, job costing is often important. A small manufacturer needs to assess accumulated costs by job. Expenses might be coded to an inventory account for financial statements purposes; the manager must know how much is coded to each job, and very often needs a cost detail by job. The accounts payable system in such a situation should have the capacity to accept job codes as well as account numbers. Reports should be generated either by job number or by account number. For a moment, consider what the job report should show. It really is irrelevant to have the ending balance of unpaid invoices classified by accounts or jobs. The ending balance represents only those invoices that remain unpaid. The accountant wants to know the total of all invoices that were charged to the job that period—that means all invoices entered into the system and charged to the job. Thus, the report should be based upon inputs into the system and not just the accounts payable balance. The system should summarize what was entered into it. Verify that the total charged to accounts or jobs equals the total of all amounts entered into the system.

Agings produced are sometimes deceiving. Aging should be based upon invoice date. In some cases, the last transaction date is used. The amounts should be broken down by period—a simplistic system dumps all activity into one column on the aging schedule. Be wary of the system that applies a partial payment against an old balance, then classifies the remaining old balance as current (apparently assigning the new transaction date to the old balance). Many users will want to specify aging classes, but few systems allow for this.

Receivables collection must frequently be tied into commission accounting, since some companies compensate salesmen when the company gets paid. Don't overlook that feature if your application warrants it.

Finance charges are another area wherein systems vary. It is nice to be able to uniformly compute and assign finance charges—many systems allow this to be done with some degree of sophistication.

This discussion should serve as a foundation for intelligent selection of the appropriate accounts payable or accounts receivable program for your application. Keep in mind the infinite variety of products sold, and consider involving your company's CPA in the final selection process.

The information in the accompanying charts was compiled from data submitted by software vendors. While every attempt has been made to ensure accuracy, there may be differences in the interpretation of questions, and certain software may have features not listed here. The numbered notes correspond to the column headings of each respective chart. □

Charts follow

Which personal computer can make you better at what you do best?

PERSONAL COMPUTER COMPARATIVE ANALYSIS			
	IBM PC	Apple III	HP-87
MAXIMUM MEMORY	256 K	256 K	544 K
SOFTWARE SELECTIONS	VisiCalc® Data Communications Word Processing CP/M® 86	VisiCalc® III Data Communications Word Processing Data Base Mgt. Business Graphics CP/M® Library Apple II Library	VisiCalc® PLUS Data Communications Word Processing Data Base Mgt. Graphics Presentations Statistics (3 pkgs.) Financial Decisions Linear Programming Math AC Circuit Analysis Waveform Analysis CP/M® Library Series 80 Users' Library
EASE OF USE			
Programmable Soft Keys	10	0	14
Error Messages	73	38	107
Built-in Disc Operating System	No	No	Yes
Built-in Screen Graphics	No	Yes	Yes
RELIABILITY			
Self Diagnostics	Yes	No	Yes
Operating Temperature	61-90°F	No figures available	32-133°F

THE BIGGEST MEMORY I'VE EVER HEARD OF.

MY KIND OF SOFTWARE.

SURE LOOKS EASY.

For you, choosing a personal computer means making an intelligent decision.

And isn't that what you do best?

The first step in your decision-making process is analysis. You look at all the numbers, and all the facts, before you leap. So you don't want a computer that's going to run short on memory. Not when you can have the HP-87 and a memory that expands to over half a million bytes.

Hewlett-Packard will make sure you don't run short on analytical software, either. For example, our VisiCalc® PLUS will let you turn up to 16,000 cells of data into bar graphs, pie charts or whatever you need to present your results graphically. And our CP/M® module gives you access to the expanding world of CP/M software.

We call it HP-Easy. Turn on the HP-87, and it's ready to go. The ROM-based operating system puts our built-in, enhanced BASIC to work for you. Instantly. The HP-87 has built-in commands and editing keys that eliminate complicated keystroke sequences. Whether you're generating a complex graph, writing a program or correcting errors.

And interfacing peripherals is as easy as putting a plug into a socket. That's the kind of craftsmanship that's putting all our Series 80 computers on the map. We're building power, friendliness and reliability into every one of them. From our portable partner, the HP-85, to the high-powered HP-87.

The most intelligent thing to do now? Get your hands on an HP-87. And then on the competition. You won't have any trouble making the right decision. Not if you want to get better and better at what you do best.

For the HP dealer nearest you, call TOLL FREE 800/547-3400 or in Oregon, Alaska and Hawaii call 503/758-1010. For additional product information, write Hewlett-Packard, Dept. 284C, Corvallis, OR 97330.

Introducing the new HP-87. It's very good at what you do.

HEWLETT PACKARD

612/02

VisiCalc® is a registered trademark of VisiCorp—Personal Software. CP/M® is a registered trademark of Digital Research, Inc.

CIRCLE INQUIRY NO. 38

Chart 1A. Accounts Payable Systems

Company Name & Address	Price	Equipment/ Operating System	1 Language	2 Source Code	3 Support Hotline	4 Series?	5 Integrated	6 Other Programs	7 Checklist	8 CRT Screens	9 Flowcharts	10 Blank Entry Forms	11 Index	12 Sample Reports	13 Vendor List	14 Vendor Information	15 Year-to-Date Statistics	16 Agings	17 Cash Requirements	18 Trial Payment
Business Application Software 16755 Littlefield Ln., Los Gatos, CA 95030	$390	CP/M	CB2	S	Y	Y	Y	G/L, A/R	N	N	Y	Y	N	Y	B	C	P	N/A	Y	Y
Business Data Control Systems 2070 Commons Rd. N., Reynoldsburg, OH 43068	$450	TRSDOS 1.3	B	N	Y	Y	N	Inventory A/R	Y	N	N	N	Y	Y	A	C	B	2	Y	N
Data Equipment Supply Corp. 8315 E. Firestone Blvd., Downey, CA 90241	$995	Commodore 2001, 4032, 8032	B	N	N	N	N/A	A/R, G/L	N	Y	Y	N	Y	Y	N/A	N/A	B	1	N	N
Dynamic Microprocessor Assoc. 545 Fifth Ave., New York, NY 10017	$595	CP/M	FOR	N	Y	N	N/A	N/A	Y	Y	Y	Y	Y	Y	B	C	B	1	N	Y
Microed 3910 Bandini St., San Diego, CA 92103	$450	CP/M, MP/M	FOR	N	N	Y	Y	Inventory P/R, A/R	N	Y	N	N	Y	Y	A	C	B	1	Y	Y
National Software Marketing 4701 McKinley St., Hollywood, FL 33021	$600	TRSDOS	B	S	Y	N/A	N/A	N/A	N	Y	Y	N	N	Y	B	C	P	1	Y	Y
Praxis Box 2307 Grand Central Station, New York, NY 10017	$150	TRSDOS NEWDOS	B	N	Y	Y	N	P/R, Mail	Y	Y	N	Y	Y	Y	B	C	N/A	1	Y	N
SMC Proprietary Systems 1011 Route 22, Bridgewater, NJ 08807	N/A	several	SMC B	S	Y	N	Y	N/A	N	Y	Y	Y	Y	Y	B	C	B	1	Y	N
Software Technology for Computers Box 428, Belmont, MA 02178	$450-775	Apple only	ASM	N	N	Y	Y	Big 5	Y	Y	N	Y	Y	Y	N	C	B	1, 2	Y	Y
STR Corp. 25 A Technology Park/Atlanta, Norcross, GA 30092	$195-695	OASIS 5.5	OASIS CB	N	Y	Y	Y	Big 5, C O/E, P/O	N	Y	N	Y	Y	Y	B	C	B	1	Y	Y
Structured Systems Group, Inc. 5204 Claremont Ave., Oakland, CA 94618	$1,250	CP/M, MP/M	CB2	A	Y	Y	Y	Big 5	Y	Y	Y	Y	Y	Y	B	C	B	1, 2	Y	Y
TLB Associates, Inc. Box 414, Findlay, OH 45840	$3,495	CP/M	PL/1 80	A	Y	Y	Y	Big 5	Y	Y	N	Y	N	Y	B	C	B	1	Y	Y

Charts 1A and 1B. Accounts Payable

1) Language—Indicates which language the system has been written in. The abbreviations are: B—Basic, MB—Microsoft Basic, CB—CBasic, FOR—Fortran, ASM—Assembly language, C—Cobol, NB—Northstar Basic
2) Source Code—Indicates whether **S**upplied, **A**vailable, or **N**ot available.
3) Support Hotline—indicates whether a support hotline exists. Generally not a toll-free WATS line.

by time periods?
18) Trial payment—does the system prepare a listing that shows what disbursements will be made?
19, 20) Capacity, as expressed in the number of accounts or transactions that can be accommodated by the system. In most cases, these are limited by the user's particular equipment more than the program itself.

4) Series—indicates whether other programs are part of a series or related package. See #6
5) Integrated—Indicates whether the other programs in the series are integrated into this package. (whether they communicate via file transfers, etc.)
6) Other Programs in Series—includes—: Big 5—inventory, accounts receivable, accounts payable, payroll and general ledger; O/E—order entry; P/R—Payroll; C—cost accounting; P/O—purchase order accounting
7) Checklist—does the documentation include checklists to help the user implement the program?
8) CRT screens—does the manual have samples of the CRT screens used by the program?
9) Flowcharts—are they included?
10) Blank entry forms—does the documentation include a series of "templates" or blank forms to help the user organize his data for use on the system?
11) Index—does the manual have a good index or table of contents?
12) Sample reports—are they included in the manual?
13) Vendor list—does the system create a list that shows vendors: A—alphabetically?; N—numerically?; B—both?
14) Vendor information—Does the system provide: A—vendor address?; B—address and phone?; C—Both?
15) Year-to-Date statistics: P—year-to-date purchases shown; C—year-to-date cash receipts shown; B—both year-to-date purchases and cash receipts shown
16) Agings: 1—produced by invoice date; 2—produced by last pay date
17) Cash requirements—does the system prepare a report that shows the cash requirements amounts
21) G/L entry—Does the system provide the user with the information necessary to make a journal entry into the general ledger, organized as a listing in journal entry form?
22) Is the system a balance-forward system or a detail system? (In a balance forward system, only the current month's transactions are retained—only the balance is brought forward each month. In a detail system, transactions are maintained on the system until they are paid or cancelled out.) B—balance forward; D—detail item forward; B/D—both
23) Partial pays—does the system allow users to pay only part of an invoice?
24) Selected pays—does the system allow users to pay only selected invoices?
25) Multiple distributions—can one invoice be distributed to several general ledger accounts?
26) Does the system allow payment by manual checks?
27) Is a separate check register prepared for manual checks?
28) Job cost accounting—does the system have provisions for posting to jobs or project cost centers (in addition to general ledger account codes)?
29) Reports by job codes—does the system prepare reports by job or project code that summarize all the activity by job or project code?
30) Discounts—How are they calculated: H—by hand and entered into the system?; A—automatically by the system?; B—both
31) Check numbers: A—assigned by the system (blank checks used); P—user's pre-numbered checks are used, system records.
32) Audit trail—does the system indicate by general ledger account what checks are charged to it? N/A—information not available

Chart 1B. Accounts Payable Systems

Company Name	Capacity—Vendors	Capacity—Transactions	G/L Entry (Data)	Balance Forward/Detail	Partial Pays	Selected Pays	Multiple Distributions	Handle Manual Checks	Separate Man. Ck. Register	Job Cost Accounting	Reports by Job Codes	Discounts	Assign Check Number	Audit Trail	Comments
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
Business Application Software	350	1,000-	Y	D	Y	Y	50	Y	Y	Y	N	B	A/P	N	
Business Data Control Systems	300	N/A	N	B	Y	N	N	N	N	N/A	N/A	N/A	N/A	N/A	totals system only; prints mailing address and return label
Data Equipment Supply Corp.	1,600	N/A	Y	B	Y	N	Y	Y	N	N	N	H	P	N	package consists of nine disks
Dynamic Microprocessor Assoc.	65,000	65,000	Y	D	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	
Microed	disk	disk	Y	N/A	Y	Y	Y	Y	N	N	N	N/A	A	Y	uses same data base as A/R and G/L
National Software Marketing	1,000	512	Y	N/A	N	Y	5	Y	N	N	N	H	P	N/A	
Praxis	500	disk	Y	B	Y	Y	N	Y	Y	N	N	B	A	Y	
SMC Proprietary Systems	N/A	disk	Y	B	Y	N/A	Y	Y	Y	Y	Y	B	A/P	Y	available for various operating systems
Software Technology for Computers	120	800	Y	B/D	Y	Y	10	Y	Y	Y	Y	B	P	Y	company markets internationally
STR Corp.	disk	disk	Y	B/D	Y	Y	10	Y	Y	N	N	B	P	Y	invoice matching by p.o. vendor or date
Structured Systems Group Inc.	9,999	250	Y	D	Y	Y	999	Y	N	N	N	B	A/P	Y	amount generation of recurring invoices
TLB Associates, Inc.	disk	disk	N/A	B/D	N/A	Y	99	Y	N	Y	Y	B	P	Y	automatic vouchering

Chart 2A. Accounts Receivable Systems

Company Name & Address	Price	Equipment/ Operating System	Language	Source Code	Support Hotline	Series?	Integrated	Other Programs	Checklist	CRT Screens	Flowcharts	Blank Entry Forms	Index	Sample Reports	Customer List	Customer Information	Agings	Audit Trail
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Business Application Software 16755 Littlefield Ln., Los Gatos, CA 95030	$390	CP/M	CB2	S	Y	Y	Y	G/L, A/P	N	N	Y	Y	N	Y	B	B	2	Y
Business Data Control Systems 2070 Commons Rd. N., Reynoldsburg, OH 43068	$450	TRSDOS 1.3	B	N	Y	Y	N	Inventory A/P	Y	N	N	N	Y	Y	A	B	2	Y
Data Equipment Supply Corp. 8315 E. Firestone Blvd., Downey, CA 90241	$995	Commodore 2001, 4032, 8032	B	N	N	N	N/A	N/A	N	Y	Y	N	Y	Y	N/A	N/A	1	Y
Dynamic Microprocessor Assoc. 545 Fifth Ave., New York, NY 10017	$595	CP/M	FOR	N	Y	N	N/A	N/A	Y	Y	Y	Y	Y	Y	B	B	1	Y
Microed 3910 Bandini St., San Diego, CA 92103	$450	CP/M, MP/M	FOR	N	N	Y	Y	Inventory P/R, A/P	N	Y	N	N	Y	Y	A	B	1	Y
National Software Marketing 4701 McKinley St., Hollywood, FL 33021	$600	TRSDOS	B	S	Y	N/A	N/A	N/A	N	Y	Y	N	N	Y	B	B	1	N
Praxis Box 2307 Grand Central Station, New York, NY 10017	$150	TRSDOS NEWDOS	B	N	Y	Y	N	A/P, Mail	Y	Y	N	Y	Y	Y	B	B	1	Y
SMC Proprietary Systems 1011 Route 22, Bridgewater, NJ 08807	N/A	several	SMC B	S	Y	N	Y	N/A	N	Y	Y	Y	Y	Y	B	B	1	N
Software Technology for Computers Box 428, Belmont, MA 02178	$275-450	Apple only	ASM	N	N	Y	Y	Big 5	Y	Y	N	Y	Y	Y	A	B	1, 2	Y
STR Corp. 25 A Technology Park/Atlanta, Norcross, GA 30092	$195-695	OASIS 5.5	OASIS CB	N	Y	Y	Y	Big 5, C O/E, P/O	N	Y	N	Y	Y	Y	B	B	1, 2	Y
Structured Systems Group, Inc. 5204 Claremont Ave., Oakland, CA 94618	$1,250	CP/M, MP/M	CB2	A	Y	Y	Y	Big 5	Y	Y	Y	Y	Y	Y	B	B	1	N
TLB Associates, Inc. Box 414, Findlay, OH 45840	$3,495	CP/M	PL/1 80	A	Y	Y	Y	Big 5, Invoice Mail, Fixed assets	Y	Y	N	Y	N	Y	B	B	1	Y

Charts 2A and 2B. Accounts Receivable

1) Language—Indicates which language the system has been written in. The abbreviations are: B—Basic, MB—Microsoft Basic, CB—CBasic, FOR—Fortran, ASM—Assembly language, C—Cobol, NB—Northstar Basic

2) Source Code—Indicates whether **S**upplied, **A**vailable, or **N**ot available.

15) Agings: 1—produced by invoice date; 2—produced by last pay date

16) Audit trail—does the system prepare a listing after each batch of transactions automatically?

17, 18) Capacity, as expressed in the number of accounts or transactions that can be accommodated by the system. In most cases, these are limited by the user's particular equipment more than the

3) Support Hotline—indicates whether a support hotline exists. Generally not a toll-free WATS line.
4) Series—indicates whether other programs are part of a series or related package. See #6
5) Integrated—Indicates whether the other programs in the series are integrated into this package. (whether they communicate via file transfers, etc.)
6) Other Programs in Series—includes—: Big 5—inventory, accounts receivable, accounts payable, payroll and general ledger; O/E—order entry; P/R—Payroll; C—cost accounting; P/O—purchase order accounting
7) Checklist—does the documentation include checklists to help the user implement the program?
8) CRT screens—does the manual have samples of the CRT screens used by the program?
9) Flowcharts—are they included?
10) Blank entry forms—does the documentation include a series of "templates" or blank forms to help the user organize his data for use on the system?
11) Index—does the manual have a good index or table of contents?
12) Sample reports—are they included in the manual?
13) Customer list—does the system create a list that shows customers: A—alphabetically?; N—numerically?; B—both?
14) Customer information—Is the customer list organized: A—by alpha?; N—by number?; B—Both?
program itself
19) Is the system a balance-forward system or a detail system? In a balance-forward system, only the current month's transactions are retained—only the balance is brought forward each month. In a detail system, transactions are maintained on the system until they are paid or cancelled out. B—balance forward; D—detail item forward; B/D—both
20) G/L entry—Does the system provide the user with the information necessary to make a journal entry into the general ledger, organized as a listing in journal entry form?
21) Sales order system—does the system have a sales order system that it links to?
22) Collection reports—are they generated automatically by aging?
23) Collection notices—does the system generate collection notices?
24) Bank deposits—does the system prepare a bank deposit form for cash receipts?
25) Credit memos—are credit memos handled in a different manner than cash receipts (i.e. are they segregated)?
26) Finance charges—does the system include provisions for calculating finance charges?
27) Commission accounting—does the system include commission accounting?
28) Detailed write-off—does the system keep a detailed list of accounts written off?
N/A—information not available

Chart 2B. Accounts Receivable Systems

Company Name	Capacity—Customers	Capacity—Transactions	Balance Forward/Detail	G/L Entry	Sales Order System	Collection Reports	Collection Notices	Bank Deposit	Credit Memo Separate	Finance Charges	Commissions	Detailed Write-off	Comments
	17	18	19	20	21	22	23	24	25	26	27	28	
Business Application Software	disk	disk	B	Y	N	N	N	N	Y	Y	Y	N	
Business Data Control Systems	300	1	B	N	N	Y	Y	N	N	N	N	Y	
Data Equipment Supply Corp.	1,600	N/A	B	Y	N	N	N	N	Y	N	N	N	package consists of nine disks
Dynamic Microprocessor Assoc.	65,000	15,000	B/D	Y	N	Y	N	Y	Y	N	N	N/A	
Microed	disk	disk	B	Y	N	Y	N	Y	N	N	N	N	universal statement
National Software Marketing	3,000	1,500	D	Y	Y	Y	N	N	Y	N	N	N	all software will be customized on request
Praxis	1,000	disk	B	Y	Y	Y	Y	Y	Y	N	Y	Y	
SMC Proprietary Systems	disk	disk	N/A	Y	Y	N	N	N	Y	Y	Y	N	other business programs from company available
Software Technology for Computers	500	1,200	B/D	Y	Y	Y	N	Y	Y	Y	Y	Y	company markets internationally
STR Corp.	disk	disk	B/D	Y	Y	Y	Y	Y	Y	Y	Y	Y	detail history for 3-36 mos; statements optional—based on user-defined criteria
Structured Systems Group Inc.	26,000	150	N/A	Y	Y	Y	Y	N	Y	Y	Y	N	maintains customer credit rating and limit; has on-line inquiry program
TLB Associates, Inc.	disk	disk	B/D	Y	Y	N	N	N	Y	Y	N	N	

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DSS/F: Paving the Way for Sophisticated Software

by Robert Moskowitz

Microcomputers are maturing rapidly, and one of the most vibrant signs of this development is the release of a program with the features of Decision Support System/ Finance (DDS), by Addison-Wesley, Reading, MA.

For those who learned computing via desktop units, DSS/F will dispel many limitations thought to be unavoidable. If your programming education was obtained on a larger system, then transferred to a micro, this program will restore features that were sacrificed in the transition.

DSS/F was conceived and runs more like a mainframe timesharing modeling plan than a system designed for the Apple. In return for slightly extended calculation times and a multi-step process to build and run a model, this program provides: much greater capacity, a wider selection of built-in formulas, on-screen prompting capabilities and automatic execution of pre-programmed instructions.

DSS/F requires a 48K-byte Apple II with two drives and Pascal system installed. You can add a third drive or (with extra-cost options) use the program with any hard disk system. To operate the program, you get Pascal running, then key-in X and specify DSS:F. The program will not engage unless a key in the shape of a typical remote control unit from a slide projector has been installed. This unit has a special plug to fit the Apple's game port. It serves as both protection against unauthorized copying and a control for on-screen slide-shows or graphic output.

Earlier versions of DSS/F were limited to 1919 cells per model. (A cell is the intersection of a row and a column in the model matrix.) Since most complex models needed more room, DSS/F provides consolidation controls to assimilate the results of several separate financial models into a single report. Newer virtual memory techniques applied to recent DSS/F updates allow more than 32,000 cells per model with rapid access to and from disk storage under automatic program control. This memory expansion potential makes the program capable of working with considerably larger models.

There are three basic types of files the program runs: LOGIC files, DATA files, and GEN files. Other files used for special functions, include JOB files, worksheet files, report files and results files. Most of these are prepared using the TEXT EDITOR system.

This line-oriented editor provides familiar insert, delete, modify and append functions. It also enables automatic capabilities for renumbering, save and back-up, search and replace, line movement and duplication and so forth. The editor has a limit of 510 lines, but provides for linking several files if more space is required. While file preparation can be tedious, the computer will relieve some anxiety by preparing some special function files on command.

LOGIC files give the computer instructions on display and manipulation of data to be used later. Essentially, they provide the structure, relationships, and formulas that comprise the financial model. The LOGIC file format necessitates specification of the row number where data will be found, then the operation to be performed on that data. The LOGIC file contains the labels, pointers and formulas that define the size, shape and function of a particular model.

In most cases, the LOGIC file is the first to be prepared. Unlike the approach warranted by spreadsheet systems, DSS/F encourages the user to design the model with pencil and paper before attacking the keyboard. One needs to consider the different types of DATA to be applied, the calculations required, the constants and variables, and (particularly) the internal references involved. These references guide the computer to the results of one calculation it will ultimately use as input for another.

Before one can run the model specified by the newly keyed-in LOGIC file, the file itself must be compiled. This can consume 3-5 minutes—a delay that is avoided through the instant recalculation programs. If bugs emerge in the model or the decision is made to modify the LOGIC, it will be necessary to return to the editor, reload the original LOGIC text file, make revisions and re-compile it before running the modified model. However, after constructing a working model, the same Logic can be used to process as many different sets of DATA as desired.

DATA files contain the raw information on which the model operates. The DATA file format requests a row number, then whatever values to be placed in each defined column. One can key-in the rows in any order because the row numbers are automatically referenced by the Logic file. Row numbers must be integers while

values must be decimals. Here there is a lot of potential for human error until this convention becomes habit.

If the LOGIC file is run on a null DATA file—or without any DATA file loaded—you can zero results in your model.

The data can be kept straight by utilizing paper worksheets to pre-organize the information. One primary attribute of the program is its ability to generate printed worksheets for this purpose.

To produce a worksheet, start with the tested and compiled LOGIC file used for model computations. By running the report generator on this LOGIC, the computer analyzes the logic and determines the data required. This information is stored automatically in a special worksheet file on the disk. When this file is printed, DSS/F yields a functional worksheet with labels, entry spaces and row numbers set up to correspond to the model. DSS/F will automatically add special prompts to the worksheet for the data needed to perform functions called for in the LOGIC, such as depreciation or loan calculations.

Completed worksheet is provided

The printed worksheet can be sent as a request for information to someone who knows nothing about computers or computer modeling. Because the worksheet is geared to your model, it is a simple job to key in all the data—with all the right row numbers—by following a completed worksheet.

Report Format Files specify the portions of the model to print, and the specific page format of that printout. Many Report Format files can produce a variety of reports from the same DATA and LOGIC files.

For example, one can specify any title for any column in the Report. In addition, report format files can include specifications for length of form, page number, printing negative numbers in brackets and special treatment of decimals. Formatting options encompass titles and headings, underlining certain numbers, using data and explanations together and column arrangements. DSS/F also provides a single command to flip the matrix 90°—rows become columns and vice versa.

Other commands in a report file facilitate prompting for a value at run time, pausing to accept keyboard input, then printing the value—such as the customer or invoice number where appropriate.

If one wishes to abstain from a full-scale report format file, output can be obtained via the Quick and Dirty reporting capability. (This is a legitimate name, and it aptly describes the process.) While report format files allow an extensive range of elaborate reporting, Quick and Dirty reports come in a standard, inflexible format. You can generate one with the single command: PRINT. These reports provide rapid access to screen display or printouts of the calculated results of the model without considering elaborate formatting or titling possibilities.

JOB files are pre-programmed sets of instructions encouraging automatic computer control of operations without need for human intervention or keyboard input.

Imagine a complex DSS/F model that carries monthly business performance figures and calculates a variety of financial figures, including net profit. By using various DSS/F commands, any portion of the rows and columns of the model can be extracted and separate results calculated for each product line, office location or other subdivision. Nothing prevents one from performing this *manually* every month, but with JOB file capability, the commands can be saved to disk. Later, that JOB file can be executed with a few keystrokes. The computer will supply its own commands, perform the calculations, and obtain the results automatically. With the proper use of JOB files, virtually any repetitive task can be pre-set to operate on autopilot.

A GEN file is another type prepared with the editor and executed later. A GEN file harbors prompts for the values of up to 20 variables, and additional commands to run, display or print results of the model. For example, using a GEN file, one can set up DSS/F to display on-screen prompts for today's sales figures and manipulate those values within a financial model and produce a complete report.

GEN commands include: ADD and SUBTRACT—for math operation, GET—for loading from disk, WRITE—for saving to disk, ASK—a prompt for input, JOB— for accessing a JOB file, and WHEN—for logical testing.

Because GEN files can engage JOB files, obtain inputs and control outputs—including disk, printer and screen displays—they can operate the computer on automatic just as effectively as if someone were at the keyboard. GEN files have the capability to display menu screens of various functions, to accept input selecting a menu option, and on that basis access the appropriate pre-written JOB file to accomplish virtually any operation anticipated. This capability means the program can be pre-set to make sophisticated functions available to relatively naive and untrained users.

By now, it should be apparent that DSS/F is a sophisticated modeling system with a long list of commands and capabilities. In action, DSS/F is fairly easy to use—but it is difficult to make good use of it. For elementary applications, simpler programs are more appropriate. DSS/F comes into its own when a model is too large to be retained in detail in one's head. It will easily accommodate modeling set-ups otherwise too large for the hardware.

Here's an example: I wanted to set up a model to calculate the cost of buying a new home. On the instant recalculation type of spreadsheet, this took me less than half an hour. I began simply and built more calculations into the model as I went. The first formula was operating within a few minutes. By keying-in the purchase price of the house, the down payment, the mortgage amounts and respective interest rates, I got the system to display the total monthly payment on the house. Later I added a Net Profit on Appreciation calculation and some other afterthought figurings.

Tedium in LOGIC file

DSS/F proved to be prohibitively cumbersome for this same chore. If I had applied the same trial-and-error process with DSS/F, it would have induced frustration. Fortunately, I knew the model I wanted to run before I powered up with DSS/F.

It still took hours to establish the LOGIC file, debug and compile the final version, enter the data, run the model, and experiment with a few sets of numbers of the crucial variables via DATAVIEW. I was exhausted and confused. DSS/F did the job, but at a terrible cost in mental overhead and tedium.

Business acquaintances borrowed the system and spent a week testing and debugging a model to monitor and project performance in a business employing 30 people. They understand models and are comfortable on timesharing systems. They started with a paper and pencil flow chart—not a vague idea and flying fingers on the keyboard. They proceeded deliberately, building their LOGIC file carefully, and making extensive use of DSS/F's built-in functions and graphics for output. Their efforts weren't thwarted by the time required. The result is an efficient set-up that can be run by a secretary—it prints attractive, detailed reports in response to a few keystrokes.

Becomes real-time system

In ordinary mode, DSS/F requires a two- or three-step process to load a DATA file, run a LOGIC file on it and print out a report. Some of these steps can be eliminated via the DATAVIEW mode.

With DATAVIEW, DSS/F is more of a real-time system. DATAVIEW is described in the documentation as a "window" into the system. In the DATAVIEW mode, one selects which rows and columns of calculated figures are to be seen on the screen or printer. Then one keys in "temporary data"—which comes from the keyboard and not a prepared DATA file.

In this DATAVIEW mode, one doesn't have to go back and forth between the EDITOR function and the calculating process. New data can be entered, observed and new data entered again. This allows for "sensitivity analysis"—the subtle testing of slightly different values to obtain the optimum set of outputs from the model. If the results of a DATAVIEW run are satisfactory, one can save the calculated results and use them later for a report or graphic display.

DSS/F has been written to emulate more sophisticated mainframe financial modeling programs. It boasts some sophisticated reporting capabilities. One intriguing output mode involves the automatic creation of a variety of color graphic displays.

DSS/F permits creation of pie charts, bar charts and line graphs automatically, and the superimposition of several—in some instances up to eight—sets of graphic displays on a single frame or video screen. The system provides its own range of calculations or accepts input. There is flexibility for positioning labels, highlighting important data, setting up standard graphs, and saving finished displays to the disk.

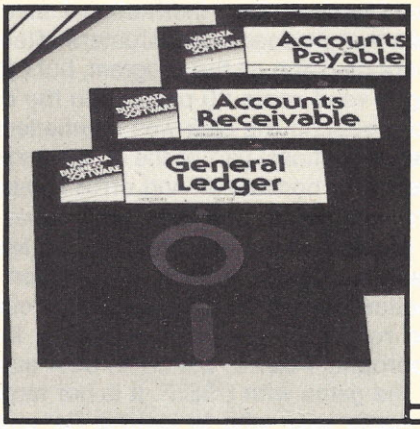
Once there are a number of displays on disk, they can be set up in slide show array and exhibited with the remote control described earlier. Other stand-alone programs provide this same function, but DSS/F offers it along with all its other modeling capabilities.

A good portion of DSS/F's documentation seems more like sales literature than instructional material. Companies claim that prospective customers often buy the manual before deciding on the program, but I found it disconcerting to read some 20 pages into the documentation before booting the disk was mentioned.

Once into the instructional part of the documentation, an extensive listing of commands and error messages emerges—with suggested solutions and ideas for eliminating the problem. A particularly satisfying feature of the documentation is the section on common mistakes. This section covers the full range of problems from failure to recompile a modified LOGIC file to feeding an inappropriate disk to the drive. User support is the name of the game with DSS/F. It is not targeted at the typical Apple user who is looking for another modeling program. Rather, the program seems designed for heavy users of timesharing systems desiring to shave their usage bills. Ferrox Systems, the company that wrote and distributed DSS/F for Addison-Wesley is ready with hot-line numbers on and personalized service to walk users through problems or hold their hands through specialized applications.

All in all, DSS/F is an omnipotent modeling system for the Apple II. Its sheer size, automatic capabilities, built-in functions, and sophistication are quite advanced. While the program might be too cumbersome for simple applications, its power can be appreciated when tackling business-oriented, large-scale modeling problems. It will not replace the instant recalculation spreadsheets, but DSS/F will undeniably pave the way for more sophisticated and extensive applications of microcomputer power. □

PERILS OF A BUSINESS SOFTWARE MANUFACTURER



by Rocky Smolin

We've been writing a lot about after-sale support problems in recent issues (see "Editor's Notebook" Mar 82). The following article offers an unusual angle, describing how one manufacturer handled the problem —offering no support at all—ed.

As a consultant to small businesses, there is nothing my firm has dreaded more than having to recommend the purchase of a specific business accounting package —particularly to uninitiated users of microcomputers. Generally, the software offerings are difficult to work with, infested with bugs and employ strange accounting practices. The support problems are tremendous, vendor supplied user-training shameful.

So it is with a sign of relief that we discovered the business package offered by Vandata (Seattle, WA). It is essentially a rework of the original Osborne/McGraw-Hill software published in book form in 1979, re-released, and re-worked by at least a dozen companies since.

The entire package—general ledger, accounts payable, accounts receivable and payroll with cost accounting, together with documentation—is available for the low price of $295. What's the catch? You don't get any support—*at all*—from the vendor.

To find out more about how this unusual state of software affairs evolved, I contacted the head of Vandata, Dwight Vandenberg.

About three years ago, Vandenberg perceived the need for some solid, inexpensive, business software to comply with the pending boom in small business computers. Seeing none, Vandenberg decided to attempt to provide the Model T of business software. He bought the Osborne package, but found a lot of bugs and features he didn't like, and spent several months reworking the package.

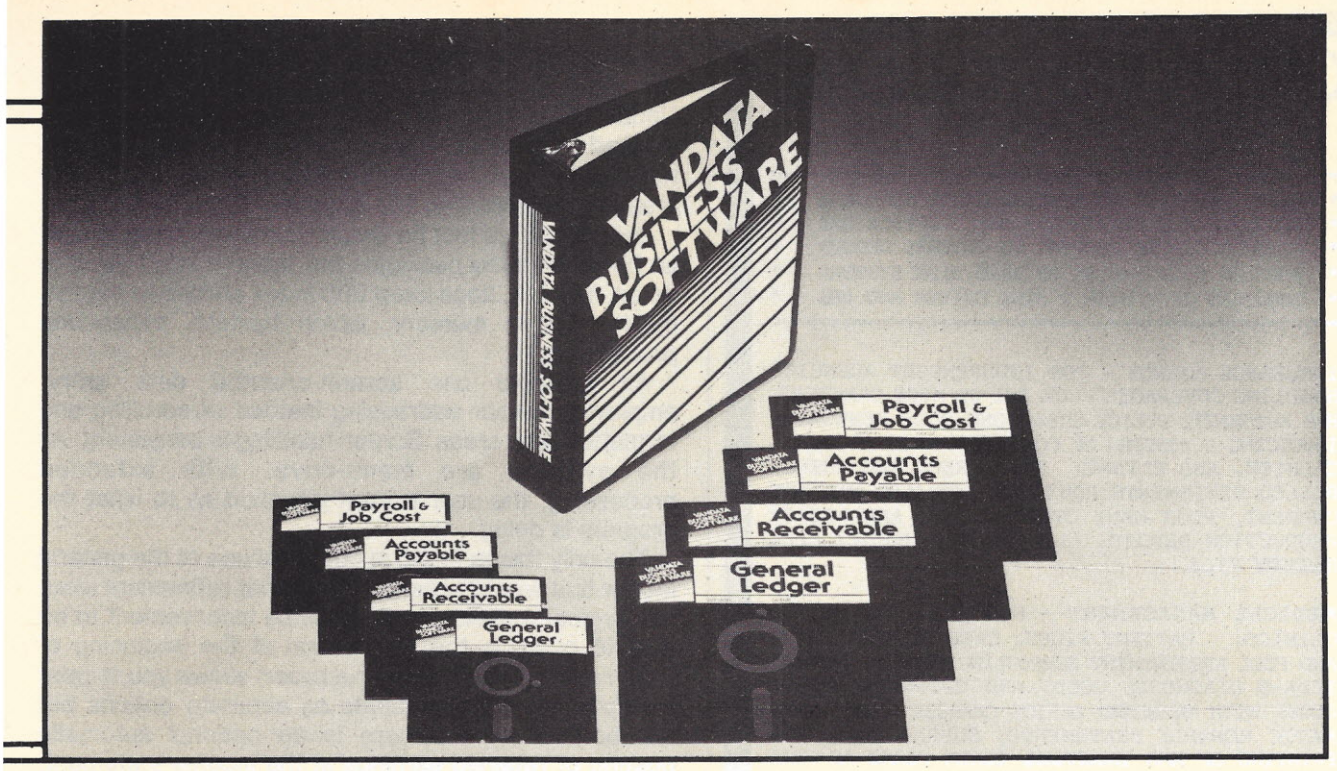
This new software was released to the marketplace for $165, which was, as he says, "as low as I could sell it for and still make money." Two problems cropped up immediately: there were still many bugs in the software, and the support problems were tremendous. Vandenberg "was spending too much time on the phone with users trying to explain how the software worked, and not enough making money." This is a painfully familiar story to anyone in the software business.

So, in April 1981 Vandenberg upped the price to $1,000. This time he offered both 100% support and a 30-day money back guarantee. What could go wrong with this plan? According to Vandenberg, his business became rife with "29 day wonders." People ordered the software, took up much of his time getting it implemented, then the software would be returned with a refund request 29 days later. Vandenberg felt he was being robbed.

Fortunately not all effort had been applied in vain. During the six months of this second false start, Vandenberg had been implementing something either admirable or questionable—depending upon your point of view. He had offered a $20 "bug reward" to anyone documenting a bona fide bug. This facilitated the conscientious spotting of a multitude of flaws—so many that Dwight contends that the packages are now essentially "bug-free." (There's always *one* more bug in a package). This gave the users some sense of compensation for tolerating flawed software. But is it ethical to make your entire customer base a test site?

Solution to the problem

That's all water over the dam now. In September 1981, tired of living with a telephone growing out of his ear, Vandenberg dropped the price to $295. The new philosophy was: *you-buy-it-you-own-it-you-can-sell-it-use-it-burn-it-I-don't-care-just-don't-call-me.* His market now focuses on software dealers. He claims that for $295, you get terrific, bug-free business software, written in CBasic2 under CP/M, and excellent documentation. His only requests are that dealers don't sell it to other dealers or call him for support. He feels that a dealer is expected to be knowledgeable



about software and programming and has the source code, thus it becomes his job to provide the support and training customers need.

How do his claims about the software hold up? If you are a fairly knowledgable end user, and are looking for good business software—particularly if you are now using one of the Osborne/McGraw-Hill implementations—you should be able to implement the Vandata no-hand-holding approach. You need to be fairly conversant with the operation of CP/M and a familiarity with CBasic2 would also help. To use this software you will need the CBasic2 run-time package—a small investment for a compiler with great utility, as there's a lot of CBasic2 software available.

Simple requirements

Hardware requirements include any 8080/8085/Z80 based system with 48K RAM (64K for Heath or Zenith), at least one double-density 8-in. drive (three are the optimum configuration), a 132-column printer, a CRT with cursor addressing, CP/M (MP/M and CDOS will work; TRSDOS will not), and at least version 2.06 of CBasic2 (CBasic will not work).

The software is supplied on four double-sided single density 8-in. diskettes. The manuals—although essentially reprints of the original Osbornes—are impressive. They come in a plush, silk screened, 2-in. three-ring binder, and besides offering a readable layout—with many figures, charts, and diagrams—they provide very complete information on the systems' operation.

Vandenberg has extracted the chapters on data files, on the special CBasic2 and hardware features, on changing the software, and some other information from each of the applications, and bound it in a separate binder labeled *Technical Information.*

A third binder, the *Installation Guide,* written entirely by Vandata, contains the information a dealer requires to configure the system. The first section covers the operation of VINSTALL, which is basically a terminal configuration program. There are a few of the common terminals already coded into a menu. With one of these, a single keystroke suffices to configure the system to your terminal. Otherwise, you need to supply the code sequences for clear screen, home cursor, up/down/left/right arrow, and address-cursor.

In addition to defining your CRT, the program also allows definition of data entry field editing options, the integration of accounts payable and accounts receivable to the general ledger, and file-to-drive placement. Unlike the original programs, Vandata allows you to specify the drives on which to place the numerous files. This information is not compiled into the program, but resides in a control file. This means the drive assignments can be changed when desired. You can also specify one of four common check formats for the A/P and P/R packages.

The second section gives some sample configurations that are helpful since (by his own admission) configuring the initial diskettes is a bit tricky. Other information in this manual covers the details of the control file, which contains the configuration parameters, notes on the CRT interface routines, guidelines to recompiling the programs and hints on the integration of the A/P and A/R to the G/L.

User can resell

The licensing agreement, which formerly restricted the buyer from reselling the software, has been modified to allow the licensee to resell the software to end users without paying royalties to Vandata. Although the original programs published in the manuals are in the public domain, substantial refinements by Vandata are proprietary.

In addition to VINSTALL and the flexible drive assignment features, Vandata has reworked the original file update scheme. For example, in the former version, additions to the general ledger master file were put in a temporary transaction file. The old file was then written, recorded by record, to a scratch area, merging the transaction file as it went. Then the

old file was deleted and the new file given the name of the old file. This meant that a scratch area as large as the old file plus the transaction file were required. Under the Vandata approach, the transaction file is merged into the existing file starting from the back and working forward, eliminating the need for a scratch area and accelerating the process.

Dwight told us that he would have liked to implement an ISAM in all the packages but found it impractical to do so. The G/L does keep 200 index entries to the G/L master file in memory, which hastens transaction processing.

All systems use screen-oriented data entry, employing cursor addressing instead of scrolling and formatted data areas. Screen handling is consistent. All the systems are menu-drive. With extended processing, the user is kept informed as to what the program is doing.

The only things found in our initial use of the general ledger that would benefit from further refinement were of marginal importance. It would be inconvenient to be able to override the top-of-form at the beginning of each report. The cash journal report allows you to print receipts and disbursements as separate options but not both at once. There is no optional automatic posting of retained earnings at the income statement, but this convenience could be added by the user with little difficulty.

Original design is followed

Reporting and processing features follow the original Osborne design. In addition to a G/L file maintenance report, the general ledger provides the postings report, G/L update (audit trail), G/L posting errors, Income Statement (trial, special, monthly, and quarterly), balance sheet, and cash journal.

Accounts Receivable, in addition to file maintenance, transaction and update reports, produces open and closed item listing (detail, summary, customer number range), A/R aging analysis, A/R unbilled items, A/R statements, and a customer list and activity report. It is an open item, invoice-oriented system. Distributions to the general ledger are handled by a special table of accounts that contains the distribution account number and the corresponding tax rate. Aging periods for receivables are user-definable. Customer demographics include name and address, last activity date, total billed this year, and total billed last year.

The accounts payable produces a check register, checks, A/P ledger (open or closed items), and vendor activity reports and lists. The system will handle invoices, credit and debit memos, allow flexible aging periods, and automatically post to the general ledger.

Payroll reports are extensive and include audit trails, transaction and error reports, as well as checks with stubs, a check register, deduction register, absentee report, payroll history, insurance report, Federal 941-A and W2s. State tax tables are not supplied and the user must alter the programs to calculate state and local taxes. Full documentation is supplied for this procedure, but Vandata warns that the undertaking requires a competent programmer.

All in all (non-support notwithstanding), the package seems to be a worthwhile option for businesses seeking a comprehensive accounting package. □

We've already written 80% of your next program.

Imagine writing better, faster business programs in 20% of the time. Now you can, with this revolutionary programming tool. Let's face it... the great majority of programming is pure busywork. Every instance of creativity may require hours of generating code. Not anymore. The Tool™ takes care of the busywork, letting you concentrate on creating.

Design attractive entry screens, validate, format, and store user input, with virtually no programming. The Tool does it for you. What used to take days — even weeks — now takes only minutes. And the result is better, faster, more professional programs.

The Tool provides an entry screen generator, a database manager, and a report formatter, each with very sophisticated capabilities.

ENTRY SCREENS:

The Tool allows you to make attractive, useful entry screens a standard part of your programs. It handles all screen editing, field formatting, and entry validation for you.

Character Validations:
alpha / numeric / blank / yes or no / signed values / password / Radix 50 / decimal point / dollars and cents

Field validations and formats:
range / valid entry / valid date / not in range / not valid entry / defaults / equal / not equal / basic check / left justify / right justify / leading zeros / invisible field / dollars and cents / 100th of cent

DATABASE:

The Tool Operating System (TOS) allows files to span multiple disk drives. Whether you have four 20-megabyte drives or 8 floppy drives and 254 diskettes, TOS can use the storage space as one large file or several — it's up to you.

The database manager of The Tool offers: fast read and write / read and write directly to variables / over 15 million records / sequential and random access / multiple disk drives / partial and masked key lookup / Corvus or floppy support / record length as large as memory

REPORTING: easy report definition / define reports directly on screen / multiple column widths / calculations at print time / totals / paging / subtotals / page numbering / headers / title

- The Tool uses less memory than old conventional programming methods.
- The Tool's many features can be used from BASIC, giving you ultimate flexibility.
- The Tool is already tested, saving you testing and debugging time.

Using The Tool is actually like having an experienced Apple II™ programmer do most of the work for you.

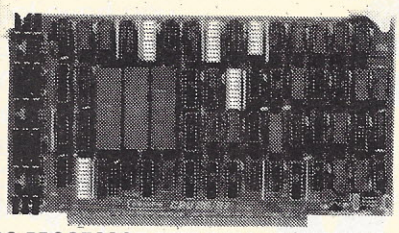
High Technology Software Products, Inc., P.O. Box IA-14665, 2201 N.E. 63rd, Oklahoma City, Oklahoma 73113
(405) 478-2105

Apple II is a trademark of Apple Computer, Inc.

High Technology Software

PRIORITY ONE ELECTRONICS

WOW! S-100 CPU NEW!



CO-PROCESSOR 8066/8087 - COMPUPRO

16 bit 8 or 10 MHz 8086 CPU with sockets for 8087 and 80130

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IFGBT186A	A&T 8MHz 8086 only	$695.00	$625.00
IFGBT186C	CSC 10MHz 8086 only	$850.00	$765.00
IFGBT186A87	A&T with 8087 option	$1295.00	$1225.00
IFGBT186C87	CSC with 8087 option*	$1550.00	$1465.00

*8087 requires slower clock speeds

CPU-Z - GODBOUT

2/4 MHZ Z80 CPU 24 Bit Addressing

IFGBT 160A A & T..... $295.00 .... $280.00
IFGBT 160C CSC 3-6 MHZ..... $395.00 ....$375.00

DUAL PROCESSOR 8085-8088 - COMPUPRO

6 or 8 MZ Provides true 16 Bit Power with a standard 8 bit S-100 bus.

IF GBT 1612A A & T 6 MHZ..... $425.00 ....$399.00
IF GBT 1612C CSC 6/8 MHZ ..... $525.00 ....$498.00

SOLID STATE DISK DRIVE, 3500% FASTER!

Not Really, But the Next Best Thing For Compupro 8085/88 Users. Call for Details on M-Drive.

IF GBT MD 128K $1,550.00
IF GBT MD 256K $3,000.00

2810 Z80 CPU-CA. COMP. SYST.

2/4 MHZ Z80A CPU with RS232C Serial I/O Port complete with Monitor FROM for 2422 Disk Controller

IFCCS 2810A A & T..... $325.00 .... $300.00

CB2 Z80 CPU - S.S.M.

2/4 MHZ will accept 2716, or 2732, or RAM

IF SSMCB2K Kit..... $260.00
IF SSMCB2A A & T..... $344.00 ....$310.00
IF SSMZ80M SSMZ80 Monitor..... $89.00

S-100 I/O BOARDS

SYSTEM SUPPORT 1 - GODBOUT

Serial port (soitware prog baud), 4K EPROM OR RAM provision, 15 levels of interrupt, real time clock, optional math processor

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IF GBT162A	Assembled & Tested	$399.00	$360.00
IF GBT162C	CSC	$495.00	$460.00
IF GBT8231	Math Chip		$195.00
IF GBT8232	Math Chip		$195.00
IF GBT162AM1	A&T with 8231 Math Chip		$555.00
IF GBT162CM1	CSC with 8231 Math Chip		$655.00
IF GBT162AM2	A&T with 8232 Math Chip		$555.00
IF GBT162CM2	CSC with 8232 Math Chip		$655.00

MPX CHANNEL BOARD - COMPUPRO

I/O Multiplexer, using 8085A-2 CPU on board

	With 4K RAM		
IFGBT166A4	A & T	$495.00	$445.00
IFGBT166C4	CSC	$595.00	$535.00
	With 16K RAM		
IFGBT166A16	A & T	$649.00	$585.00
IFGBT166C16	CSC	$749.00	$675.00

INTERFACER I - COMPUPRO

Two Serial I/O

IFGBT133A	A & T	$249.00	$219.00
IFGBT133C	CSC	$324.00	$298.00

INTERFACER II - COMPUPRO

Three parallel, one serial I/O board

IFGBT150A	A & T	$249.00	$219.00
IFGBT150C	CSC	$324.00	$289.00

INTERFACER III - COMPUPRO

Eight channel multi-use serial I/O board

IFGBT1748A	A & T	$699.00	$629.00
IFGBT1748C	CSC 200 hr. 8 Port	$849.00	$750.00
IFGBT1745A	A & T	$599.00	$559.00
IFGBT1745C	CSC 200 hr. 5 Port	$699.00	$629.00

MULTI I/O - MORROW DESIGNS

Three Serial, Two parallel

IFMDSM83200 A & T $359.00 $329.00

SWITCHBOARD - MORROW DESIGNS

Two serial I/O, four parallel I/O, one status port, one strobe port

IF MDSSB2411 $299.00 $269.00

I/O4 - SSM

Two serial I/O, two parallel I/O

IFSSMI04K	Kit		$210.00
IFSSMI04A	A & T	$290.00	$260.00

I/O 5 - SSM

2 Serial, 3 Parallel including 1 Centronics

IFSSMI051 A & T $329.00 $309.00

I/O 8 - SSM

8 Port Serial I/O with Timer

IF SSMI08A A & T $550.00 $495.00

2710 4 PORT SERIAL - CCS

4 Full handshaking RS232 ports and optional 2K ROM

IFCCS271001 A & T $325.00 $310.00

2719 2 SERIAL & 2 PARALLEL - CCS

2 RS232 C ports, 2 8 bit parallel ports, & optional 2K ROM

IFFCCS271901 A & T $360.00 $340.00

2720 4 PORT PARALLEL - CCS

4 8 bit parallel ports and optional 2K ROM

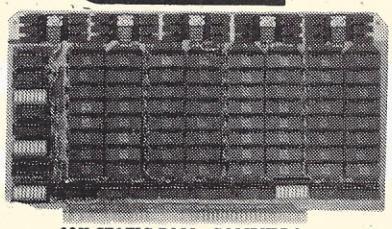
IFCCS272001 A & T $275.00 $260.00

S-100 10 MHZ STATIC RAM

NEW LOW PRICES!

RAM 20 - 32K

CompuPro™



32K STATIC RAM - COMPUPRO

RAM 20 10 MHZ, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IF GBT164AA8	8K A&T	$210.00	$190.00
IF GBT164AC8	8K CSC	$280.00	$260.00
IF GBT164AA16	16K A&T	$285.00	$260.00
IF GBT164AC16	16K CSC	$355.00	$325.00
IF GBT164AA24	24K A&T	$355.00	$325.00
IF GBT164AC24	24K CSC	$425.00	$385.00
IF GBT164AA32	32K A&T	$425.00	$385.00
IF GBT164AC32	32K CSC	$495.00	$450.00

CMOS STATIC RAM

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of **BYTE.**

64K CMOS STATIC RAM - COMPUPRO

RAM 17, 10 MHZ, 2 Watt, DMA Compatable 24 Bit Addressing

IFGBT175A64 64K A&T $599.00 $550.00
IFGBT175C64 64K CSC 200hr. $699.00 $650.00

NEW! 32K x 16 BIT CMOS STATIC RAM - COMPUPRO

8 and/or 16 Bit

816 *RAM 16 10 MHZ, 32K x 16 or 64K x 8 IEEE/696 16 BIT 2 Watt, 24 Bit Addressing*

IFGBT180A 64K A&T $650.00 $599.00
IFGBT180C 64K CSC $750.00 $699.00

NEW! 128K NMOS STATIC RAM - COMPUPRO

816 RAM 21 12MHz, 128K x 8 or 64K x 16 TEEE/696 8 or 16 Bit 1.2 Amps 24 Bit Addressing

IF GBT190A 128K A&T $1695.00 $1610.00
IF GBT190C 128K CSC $1895.00 $1795.00

S-100 PROM

PBI PROM PROGRAMMER - SSM

Programs 2708 or 2716's, operates as a 4K/8K EPROM BOARD AS WELL.

IF SSMPB1K Kit $179.00
IF SSMPB1A A & T $265.00 $220.00

ECONOROM 2708 - COMPUPRO

16K x 8 EPROM Board using 2708, Power on jump to any 256 byte

IF GBT125A A & T $135.00 $120.00
IF GBT125C CSC $195.00 $175.00

MB8A - SSM

1K/16K 2708 EPROM board, disable in 1K increments

IF SSMMB8AK Kit $114.00
IF SSMMB8AA A & T $179.00 $159.00

S-100 VIDEO BOARDS

SPECTRUM - COMPUPRO

Color Graphics board with Parallel I/O

IF GBT144A A & T $399.00 $349.00
IF GBT144C CSC $449.00 $399.00
IF GBT2D Sublogic Universal Graphics Interpreter Software $35.00

VB - 3 S.S.M.

80 x 25 or 50 character video display Memory Mapped, Parallel Keyboard port

IF SSMVB3K24 80 x 24 Kit $425.00
IF SSMVB3A24 80 x 24 A&T $499.00 $440.00
IF SSMVB3UP 80 x 50 Line Upgrade $ 39.00

VB2-S.S.M.

I/O Mapped Video Board, with Parallel Keyboard port 64 x 16

IF SSMVB2K Kit $199.00
IF SSMVB2A A & T $269.00 $229.00

VBBB - S.S.M

Memory Mapped Video Board 64 x 16 character display or 64 x 16 graphics display

IF SSMVB1K Kit $179.00
IF SSMVB1A A & T $242.00 $220.00

S-100 CLOCK CALENDAR

IF QTCCCSA *Assembled & Tested* $150.00

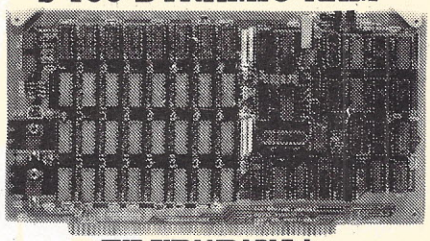
As seen in March Kilobaud Magazine

S-100 MOTHERBOARDS - COMPUPRO

Active termination, 6-12-20 slot

IF GBT153A	A&T 6 slot, 2 lbs	$140.00	$126.00
IF GBT153C	CSC 6 slot, 2 lbs.	$190.00	$175.00
IF GBT154A	A&T 12 slot, 3 lbs.	$175.00	$155.00
IF GBT154C	CSC 12 slot, 3 lbs.	$240.00	$220.00
IF GBT155A	A&T 20 slot, 4 lbs.	$265.00	$235.00
IF GTB155C	CSC 20 slot, 4 lbs.	$340.00	$310.00

S-100 DYNAMIC RAM



THE EXPANDABLE 1
PRIORITY 1 ELECTRONICS

THE EXPANDABLE 1™ 64K Dynamic Ram board provides your S-100 system with 64K of reliable, high-speed dynamic RAM. Compatable with most of the major S-100 systems on the market, including those with front panels, it supports DMA operations and requires no Wait states with current microprocessors.

- *User expandable from 16 to 64K*
- *Supports DMA*
- *Designed to IEEE proposed S-100 bus standards*
- *2 or 4 MHz operation*
- *Operates with either an 8080 or Z-80 based S-100 system, providing processor-transparent refreshes with both*
- *Supports IMSAI-type front panels*
- *Jumper-selectable Phantom input*
- *Uses Popular 4116 RAMS*
- *All ICs in sockets*
- *Any 16K block can be made bank-independent*
- *Fully buffered address and data lines*
- *Fail-safe refresh circuitry for extended Wait states*
- *Board configuration with reliable, easy-to-configure Berg jumpers*

IF PRIEXP116	16K Assembled & Tested		$299.00
IF PRIEXP132	32K Assembled & Tested		$339.00
IF PRIEXP148	48K Assembled & Tested		$379.00
IF PRIEXP164	64K Assembled & Tested		$409.00

S-100 DISK CONTROLLERS

2422A - CA. COMP. SYST.

I/O Mapped, controls 8", single or double density A&T with CPM 2.2 8" S.D.

		LIST PRICE	OUR PRICE
IF CCS2422A		$475.00	$375.00

DISK JOCKEY 2D - MORROW

Memory Mapped, controls 8", single or double density, serial I/O

IF MDIDJ2208 A&T with CP/M 2.2 $399.00 $375.00

S-100 DISK SUBSYSTEMS

DJ2B DISCUS SINGLE SIDED MORROW

8" DBL Density drives with cabinet, power supply controller, with CP/M 2.2 and Microsoft Basic

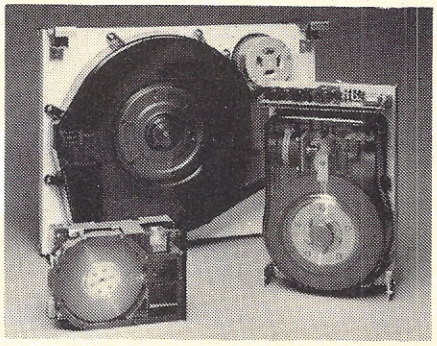
IF MDSF1218 Single Drive System $1095.00 $950.00
IF MDSF1228 Dual Drive System $1875.00 $1598.00

DJ2B DISCUS DOUBLE SIDED - MORROW

8" DBL Density/sided drives with cabinet Power supply controller, with CP/M 2.2 and Microsoft Basic

IF MDSF2218 Single Drive System $1395.00 $1250.00
IF MDSF2228 Dual Drive System $2495.00 $2050.00

S-100 HARD DISK - MORROW

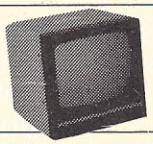


5.25" 5MB, 8" 10 & 20MB, 14" 26MB formatted hard disk complete with cabinet, P.S., Controller, CP/M 2.2 and Microsoft MBASIC 80

		LIST PRICE	SALE PRICE
IF MDSDMAM5	5 MB	$2495.00	$1995.00
IF MDSM10S	10 MB	$3695.00	$2950.00
IF MDSM20S	20 MB	$4795.00	$3825.00
IF MDSM26S	26 MB	$4495.00	$3495.00

WOW!

BEST PRICE!



NEW! GREEN 80 x 24

OUTPERFORMS MONITORS OF TWICE THE PRICE!

USI has the competition buckling at their knees! You can have a professional performing Video Monitor for a **fraction of the cost! The USI PI2 (Green).**

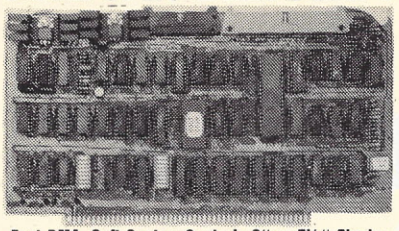
The USI PI2 (Green of PI3 (Amber) is a high resolution data display compatible with 80 x 24 computer formats.

		List Price	Sale Price
IFUSIPI2	12" Green 24 lbs.	$275.00	$149.00
IFUSIPI3	12" Amber 24 lbs.	$289.00	$209.00

OUR NEW CATALOG IS IN THE MAIL TO YOU NOW!

PRIORITY ONE ELECTRONICS

COMPUPRO DMA DISK 1



Fast DMA, Soft Sector, Controls 8" or 5¼" Single or Double Density. OUR BEST!

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
IFGBT171A	A&T	$495.00	$450.00
IF GBT171C	CSC	$595.00	$555.00
IF GBTCPM80*	CP/M 2.2 for Z80/8085 with manuals & BIOS 8" S/D disk		$175.00
IF GBTOAS8S	Oasis 8 bit single user 8" S/D disk		$500.00
IF GBTOAS8M	Oasis 8 bit multiuser, 8" S/D disk		$850.00

PRIORITY ONE ELECTRONICS IS PROUD TO ANNOUNCE THAT WE NOW STOCK

DUAL SYSTEMS PRODUCTS

CPU/68000-8MHz 68000 CPU

16 bit 68000 CPU with on board ROM containing MACSBUG Monitor or Motorola 68541 Memory Management Unit (MMU).

IFDULCPU68000 A&T with Monitor $1195.00 **$1075.00**
IFDULCPU68000M A&T with MMU $1495.00 **$1395.00**

DMEM256KP-256K DYNAMIC MEMORY MODULE

256Kb with byte parity error detection for 8 or 16 bit computers

IFDULDMEM256K 256K A&T $1495.00 **$1395.00**

CMEM NONVOLATILE CMOS MEMORY

Nonvolatile CMOS memory with 3-10 year battery backup on board

IFDULCMEM8K 8K A&T $695.00 **$629.00**
IFDULCMEM16K 16K A&T $795.00 **$725.00**
IFDULCMEM32K 32K A&T $995.00 **$940.00**

2716/2732 EPROM BOARD WITH 16BIT DATA PATHS

Designed to hold 32Kb of 2716 type or 64Kb of 2732 type EPROMS, or ROMS for read only use with 16 bit CPU systems.

IFDULEPROM323K 2716 EPROM Board A&T $295.00 **$280.00**
IFDULEPROM64K 2732 EPROM Board A&T $295.00 **$280.00**

AIM12-12 BIT A/D CONVERTER

A/D input module with 12 bit accuracy, 32 input channels and optional instrumentation amplifier.

IFDULAIM12 A&T with Instru. Amp. $785.00 **$745.00**
IFDULAIM12B A&T without Instru. Amp $695.00 **$660.00**

AOM12-12 BIT D/A CONVERTER

D/A output module, 4 channels, 12 bit accuracy. Optional VIC420 industrial output module (4-20Ma), 4 channels, used in conjunction with AOM12.

IFDULAOM12 A&T $675.00 **$640.00**
IFDULVIC420 A&T $675.00 **$640.00**

CLK24-NONVOLATILE CLOCK/CALENDAR

Day, date, hours, minutes, seconds, and 3-5 year battery backup on board. Read or write directly from I/O port.

IFDULCLK24C A&T with 60Hz Interrupt $300.00 **$285.00**

PRINTERS

BEST PRICE!

MICROLINE — OKIDATA WITH FRICTION AND TRACTOR FEED

- BI-DIRECTIONAL - 120 CPS
- 9x9 Matrix (Alphanumeric)
- 6x9 or 12 Matrix for Graphics
- 5,8.3, 10,16 Charactrs p/Inch
- 6 or 8 Lines per Inch
- 80 CPL@10 CPI for 82A
- 132 CPL@10 CPI for 83A
- Parallel and Serial I/O
- 100 Thru 1200 Baud
- Self Test
- Out of Paper Switch
- Friction or Tractor Feed
- 3" to 14" Top of Form (Switch Selectable)
- 10 Different Character Sets

PART NO.	DESCRIPTION	LIST PRICE	SALE PRICE
IF OKIDAT82AT(26 lbs)	80 CPL @10 CPI	$ 799.00	$539.00
IF OKIDAT83AT (37 lbs)	132 CPL @10 CPI	$1195.00	$750.00
IF OKISER2KBF	9600 baud with 2K Serial Buffer upgrade with X-on Y-off		$150.00
IF OKIGRAPH	High Resolution Graphics Prom		$99.00

CALL FOR THE NEW MICROLINE 84

MX80 — EPSON NEED WE SAY MORE?

IF EPNMX80 Tractor Feed 17 lbs $645.00 **$450.00**
IFEPNMX80FT Tractor & Friction Feed $745.00 **$550.00**
IF EPNMX100 132 Col. Tractor Feed 24 lbs **$725.00**

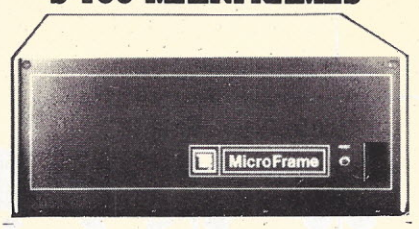
PRINTER INTERFACES - MICROBYTE

RS232 Serial Conversion for MX80

IFMBSSEI1 A & T **$55.00**
Apple Centronics 8 bit parallel interface for Centronics, Epson & OKIDATA printers
IFMBSAEI1 A & T **$55.00**
IFMBSAEC1 Cable for above **$14.95**

Printer interfaces & cables sold only with printer purchase

S-100 MAINFRAMES



S-100 MICROFRAME - TEI

110V 60HZ CVT Mainframes, the best money can buy!
12 Slot ±8V 17A±16V @ 2A
22 Slot ±8V @ 30A± 16V @ 4A

PART NO.		LIST PRICE	OUR PRICE 1-9	10-24
IF TEIMCS 112	12 Slot Desk	$755.00	$660.00	$627.00
IF TEIMCS 122	22 Slot Desk	$910.00	$798.00	$776.00
IF TEIRM 12	12 Slot Rackmount	$800.00	$715.00	$681.00
IF TEIRM 22	22 Slot Rackmount	$965.00	$860.00	$825.00

Shipping Weight: On 12 Slot Mainframe 45 lbs.
On 22 Slot Mainframes 55 lbs.

TEI S-100 FRAMES 3 - 5" DISK CUTOUTS

±8V @ 17±16V @ 1.2A, Internal Cables

			1-9	10-24
IF TEITF12	12 Slot desk	$745.00	$670.00	$638.00
IF TEIRF12	12 Slot Rackmount	$855.00	$765.00	$732.00

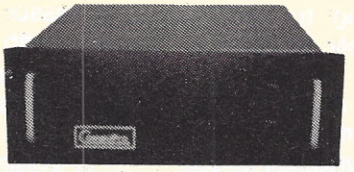
Shipping Weight: On 12 Slot Desk 40 lbs.
On 12 Slot Rackmount 45 lbs.

DUAL 8" DISK DRIVE CHASSIS - TEI

For Shugart 801/851R or QUME DT8 size drives. Internal power cables provided.

+24V @ 1.5A+5V @ 1.0A - 5V @ .25A

			1-9	10-24
IF TEBCFDD	Desk Top	$565.00	$520.00	$480.00
IF TEIRFDD	Rack Mount	$725.00	$650.00	$630.00



S-100 MAINFRAME - COMPUPRO

110V 60HZ CVT Mainframe uses famous 20 slot COMPUPRO Motherboard. 55 lbs.

IFGBTENC20RM 20 Slot Rack Mount $895.00 **$825.00**
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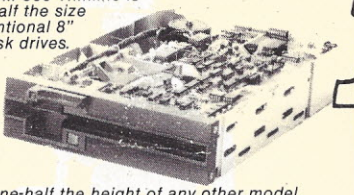

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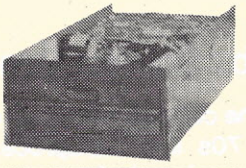

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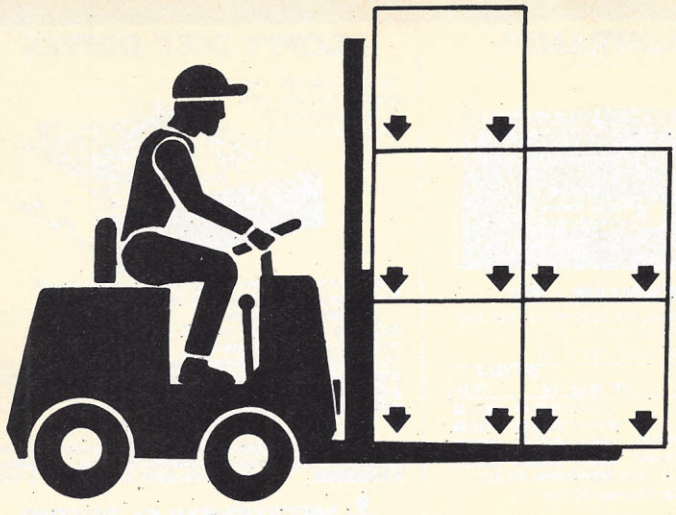

Suppliers of Multiprocessor Equipment

by Bernard Conrad Cole

Utilizing the considerable body of research conducted during the 70s into multiprocessing and continuing advances in semiconductor and communications technology as a foundation, a number of multi-microprocessor computing systems are beginning to appear. While not as powerful as mainfraime uniprocessors, multi-microprocessor systems are beginning to assume some of the business chores previously handled by larger systems.

In two preceding installments of this series (*IA* Apr and May 82), we introduced the topic of multiprocessor schemes and discussed the ideal configurations. In this concluding article, we will survey some of the manufacturers of multiprocessor system hardware.

Commercial multiprocessor systems fall into two categories: closely-coupled and loosely-coupled. Into the first category fall such products as OSM's Zeus multiprocessor computer system, Intertec Data System's Compustar, Action Computer's Discovery Multiprocessor, TEI's System 48 and Micromation's Mariner System.

Two of the most impressive entries in this category are Molecular Computer's InfiNET and Ohio Scientific's OS-65U Networking System.

Molecular's InfiNET series is a family of multiprocessor systems that support up to 32 simultaneous users in a full CP/M-compatible environment. The approach is designed to eliminate overhead and degradation problems associated with other network architectures—such as those based on a polling scheme.

With InfiNET, each user has an application processor. A Megabus interprocessor link enables each appplication processor to talk directly to another. It gives users direct access to private or common files in a file processor, as well as a direct link to shared peripheral.

Based on a contention bus design, the Megabus enables data transfers between independently operating application processors and the file processor at 1.25M bytes per second.

A minimum InfiNET-I configuration consists of a Z-80 based file processor with 64K bytes of RAM, 10M bytes of Winchester disk storage and an 8-in. floppy disk drive. It can be operated either as a standalone system under CP/M version 2 or as a node in a multi-microprocessor system, supporting up to eight simultaneous users.

A minimum configuration, InfiNET II includes the file processor, 30M bytes of 8-in. Winchester disk storage, 500M bytes of 8-in. floppy disk storage, 20M bytes of tape backup, and supports up to 32 simultaneous users. With the addition of a 62- or 140-Mbyte Winchester drive, total system storage can comprise 170M bytes.

As user terminals are added to an InfiNET multiprocessor system, additional application processors (each with a Z-80, 64K bytes of RAM. and 2K of PROM) are installed in a central Network Unit. N/STAR resides in the file processor and uses about half of the onboard RAM. The remainder provides 32K bytes of disk buffer —to enhance throughput in multiple user applications.

As users are added, N/STAR automatically reconfigures itself to recognize additions. The N/STAR network operating system provides concurrent file sharing—as well as password security, record locking, private and common user files, foreground/background processing and print spooling.

More impressive is Ohio Scientific's OS-65U network system, which can interconnect up to 16 hard disk based timesharing systems (level 3), as well as up to 15 floppy disk based microcomputer systems (level 2). Each can support up to 16 microprocessor-based intelligent terminals (level 1). In all, literally thousands of users can be interconnected for hard disk data and program sharing. Speed of data transmission between computers can be as high as 500,000 bits-per-second.

Each level 2 computer consists of a Challenger II or III with 56K bytes of RAM and an 8-in. floppy disk and one data base communications port linked to a level 1 intelligent terminal. Minimal requirements for a level 3 network data base are either an Ohio Scientific C3-C or C3-B computer with 23 or 74M bytes of Winchester disk storage, 100K bytes of RAM and a special interface board for network and cluster communications.

Each terminal can be connected to its associated computer with up to 50 feet of cable, or if modems are used—an unlimited distance via telephone lines. High speed links are limited to a maximum of 10,000 feet.

The loosely-coupled category envelops general purpose local area networking systems and special purpose systems designed for business applications —like Nelma's NDX-100 electronic filing system, System Development Corp.'s SDC Records Manager,

and Convergent Technologies' information processing systems.

Typical of the loosely-coupled LAN-based multiprocessors that permit linking multiple workstations, terminals and/or personal computers together into multiprocessor computing systems is Ethernet. It is the most publicized local packet networking offered today. Developed by Xerox's Palo Alto, CA, research center, it was initially conceived as a broadbase packet-switching medium in which each station's transceiver selects appropriate messages based on the packet's leading address. Ethernet was designed primarily to support Xerox's entry into the office automation market. Now the alliance involves Digital Equipment, Intel, Zilog's Z-Net and Ungerman-Bass' Net/One. Typical capacity ranges from 200 to 300 nodes, and overall distance is 1 to 2 miles.

Network Systems' Hyperchannel and Hyperbus offerings are similar to Ethernet in many ways. Hyperchannel can extend up to one mile without repeaters. A maximum of 64 devices can be multidropped from Hyperchannel, which uses an 8-bit address.

One of the first entries in the broadband arena was Digital Communications' Paklom system. A more recent participant is Sytek, with its manufacturing subsidiary, Network Resources. Sytek offers two high performance network products: Localnet 20 and Localnet 40. It can support 120 networks on a single cable and broadcasts over 15 miles. A system can consist of up to several thousand Localnet nodes without significant signal loss or increase in noise and error.

A variation of the LAN approach is Compucorp's Omeganet. It is a distributed resource network system featuring a network of subnetworks. Omeganet uses a departmental grouping of 2-16 microprocessor-based workstations that can be linked to any number of additional departmental networks. This enables a workstation in a subnetwork to communicate with another workstation or data base in any other subnetwork.

Toward more power

Present 8-bit CPU-based multiprocessor systems can manage business processing jobs previously handled by large mainframe uniprocessors. But personal computers based on the newer 16- and 32-bit CPUs will be required in order to build multiprocessor networks equivalent in power to mainframe uniprocessors. Typical CPUs include National's 16000, Intel's iAPX 432, Zilog's Z8000 and Motorola's 68000. A number of new 16-bit personal computers have begun to appear, including IBM's Personal Computer, the Apple III, and Tandy's entry, combining a Z-80 and a 6800 into the same unit.

Compared to 8-bit designs, the new 16-bit CPUs offer advantages to system designers including compatibility with high level languages, faster throughput, larger memory, and addressing space in the megabyte range—as well as built-in multiprocessing capability.

Eight-bit microprocessors are generally limited to an addressing space of 64K bytes. The addressing range of the new 16-bit CPUs is enormous—generally 1M byte or more—with the 32-bit CPU in excess of 10 to 20M bytes—at a minimum. Some operate in an extended or segmented mode for additional capability. Sophisticated memory management schemes can extend memory range and provide memory protection, segment variation and relocation.

Typical of the newer generation of multiprocessor systems is Convergent Technologies' family of multifunction advanced workstations. Each is based on the Intel 8088 and provides up to ½M byte of mass storage in each desktop unit. The AWS family consists of four members:

AWS-210, which supports from 128K to 512K bytes of RAM, has no mass storage and may be used as a cluster station;

AWS-220, similar to the AWS-210, except that it supports one minifloppy unit with a formatted capacity of 315K bytes, and can operate as either a standalone unit or as a cluster station;

AWS-230, with up to 256K bytes of RAM and two minifloppies with a total capacity of 630K bytes, and can operate either as a standalone unit or as a cluster station with local mass storage; and,

Enhanced configurations

AWS-240, which supports from 256K to 512K bytes of RAM, a minifloppy and mini-Winchester with a total capacity of 5.3M bytes. (In addition to all the other options, it can act also as a master station in a cluster.)

The AWS incorporates the company's CTOS operating system for real time, multitasking operation. Data management facilities include multi-key ISAM with record level locking for flexible access to records and a sort-merge facility that sorts multiple unordered record files and merges them with ordered records into a single ordered file. Four industry standard protocols are supported: 3270 terminal emulator, RJE terminal emulator, asynchronous terminal and X.25 terminal emulation.

The CTOS operating system supports local resource sharing networks as well as standalone work stations. In a cluster configuration of up to 16 work stations, essentially the same operating system executes in each work station and in a shared resource master processor.

System Development Corp.'s Record Manager is based on the Multibus—a parallel bus providing a 16-bit data path, twenty bits of memory address and arbitration of conflicts between multiple bus masters. It uses a mix of 8- and 16-bit CPUs, specifically 8085s and 8086s. Except for the central processor, all are dedicated to specific system functions. About ½M byte of main storage is used in each processor for program and working storage, all of which is addressable via the Multibus.

Program storage is a mix of RAM and ROM, depending on the specific function and the likelihood of changes in the module function. The Records Manager is designed for as many as four disk drives of up to 600M bytes of storage. One Winchester disk is housed in a central cabinet with a capacity of 80 to 160M bytes. A high capacity tape cartridge provides backup capability. The system supports asynchronous communications with terminals and standalone processors, binary synchronous communications with peer and/or larger host computers and interfaces to LAN type communications networks via dedicated 8-bit microprocessor-based communication controllers.

A major block to achieving the throughput of a mainframe uniprocessor in a multiprocessor configura-

tion is the interprocessor communications rate. Based as they are on either broadband, baseband or twisted pair links, the best LANs and multiprocessor networks can achieve is perhaps 2M bits-per-second data rates. Fortunately, optical fiber link technology has advanced to the point that LANs and multi-microprocessor networks are possible at 50 to 100 times present data rates.

One such system is an optical link from Codenell Technology of Yonkers, NY. It extends asynchronous data rates from DC up to 100M bits using an advanced laser technique. Codenell optical links have been designed, which boost the performance of data processing and word processing systems supporting Ethernet. Other vendors active in this area include Optical Communication, Canoga Data Systems and Valtec.

At Hewlett Packard's Optoelectronic Division in Palo Alto, CA, a sophisticated fiber optic local area networking scheme has been developed—called Anarchy. It is designed to use fiber optic links in networks consisting of over 100 nodes employing data transmission rates in excess of 100 Mbits and spanning distances up to 10 kilometers.

Another obstacle has been the void of operating systems that work adequately in that environment. While specific vendors of multiprocessor systems have developed solutions peculiar to their own processing environments, general purpose solutions have been lacking.

For personal computers and multiprocessor systems operating in the MP/M and CP/M environment, Digital Research has developed several network oriented operating systems: CP/NET and three related systems, CP/NOS, MP/NET and MP/NOS.

CP/NET allows microcomputers to share and transfer disk files, to share printers and consoles and to share programs and data bases. It consists of masters running on MP/M and slaves running on CP/M. The masters are hosts that manage the shared resources that can be accessed by the network slaves.

CP/NOS is a diskless CP/M that can be stored in solid state ROM—operating with a console, memory and network interface. MP/NET is a complete MP/M system with an embedded network interface. Like CP/NET, it allows local devices to be re-assigned to the network. MP/NET configurations allow MPM systems as both requestors and servers with CP/M requestors. MP/NOS contains the real time portion (RTM) of MP/M without local disk facilities. Like CP/NOS, MP/NOS performs all disk functions through the network.

A unique operating system configuration, MP/M-8/16 by G & G Engineering (San Leandro, CA) is a proprietary implementation of Digital Research's MP/M-86. It allows for simultaneous running of both 8- and 16-bit processors in a multiuser, multiprocessing environment. The system is used in conjunction with the 8085/8088 CPU board by Godbout (Oakland, CA).

For UNIX systems operating in the multiprocessor environment, 3Com Corp. of Menlo Park, CA, has developed UNET—a communications software package that enables UNIX Version 7.0 users to build networks.

UNET offers file, terminal, and mail communication services—either for direct use from UNIX-based microcomputers or use from computer programs written to run on UNIX. By writing programs that call UNET facilities, use of UNET can be extended to handle the communication needs of inexperienced users.

UNET also provides these services for UNIX, using standard vendor-independent packet internet protocols. Use of UNET on the 8086, Z8000 and the Motorola 68000 also enable communication with non-UNET, non-UNIX computer systems.

Even as multi-microprocessor systems of medium power become commercially available, research is continuing in the development of more sophisticated configurations. Ultimately, many could allow the linking of thousands of microprocessors into a single coordinated computing system. These include:

the Relational Associative Processor (RAP) at the University of Toronoto;

MICROS, a distributed operating system, for use on Micronet, a reconfigurable multi-microprocessor network;

DEMOS, a system under development at Great Britain's National Physical Laboratory;

the X-NET project at the University of California at Berkeley;

Mu-NET, at the Massachusetts Institute of Technology;

MP/C, a multiprocess/multicomputer architecture under development at Princeton University; and,

DIRECT, a multiprocessor organization for supporting relational data bases under development at the University of Wisconsin. □

*Portions of this three-part series were adapted, by permission, from articles by Michael Roberts that appeared in **MiniMicro Systems**, Cahners Publishing Co., Boston, MA, Oct. and Nov. 1980.*

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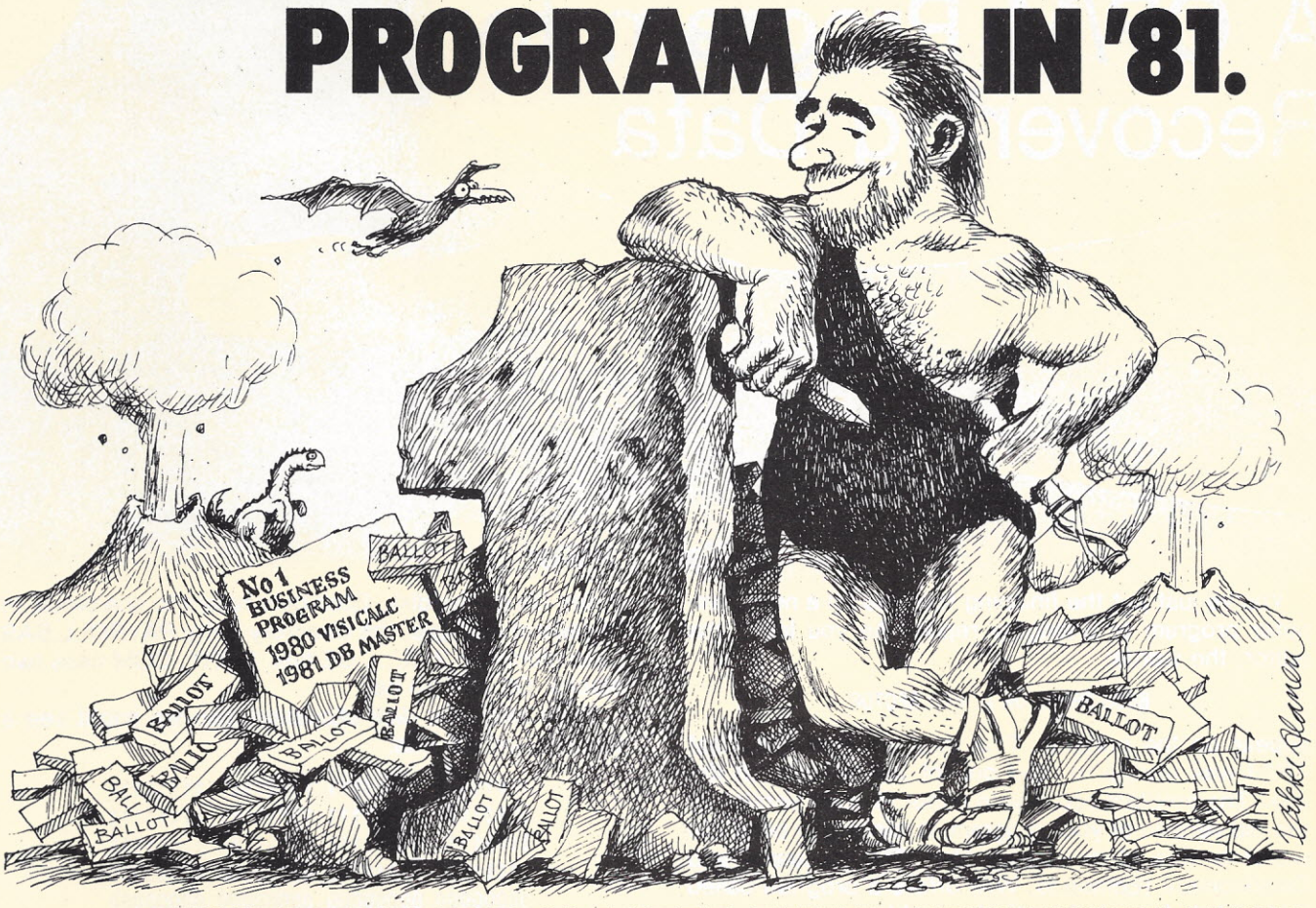

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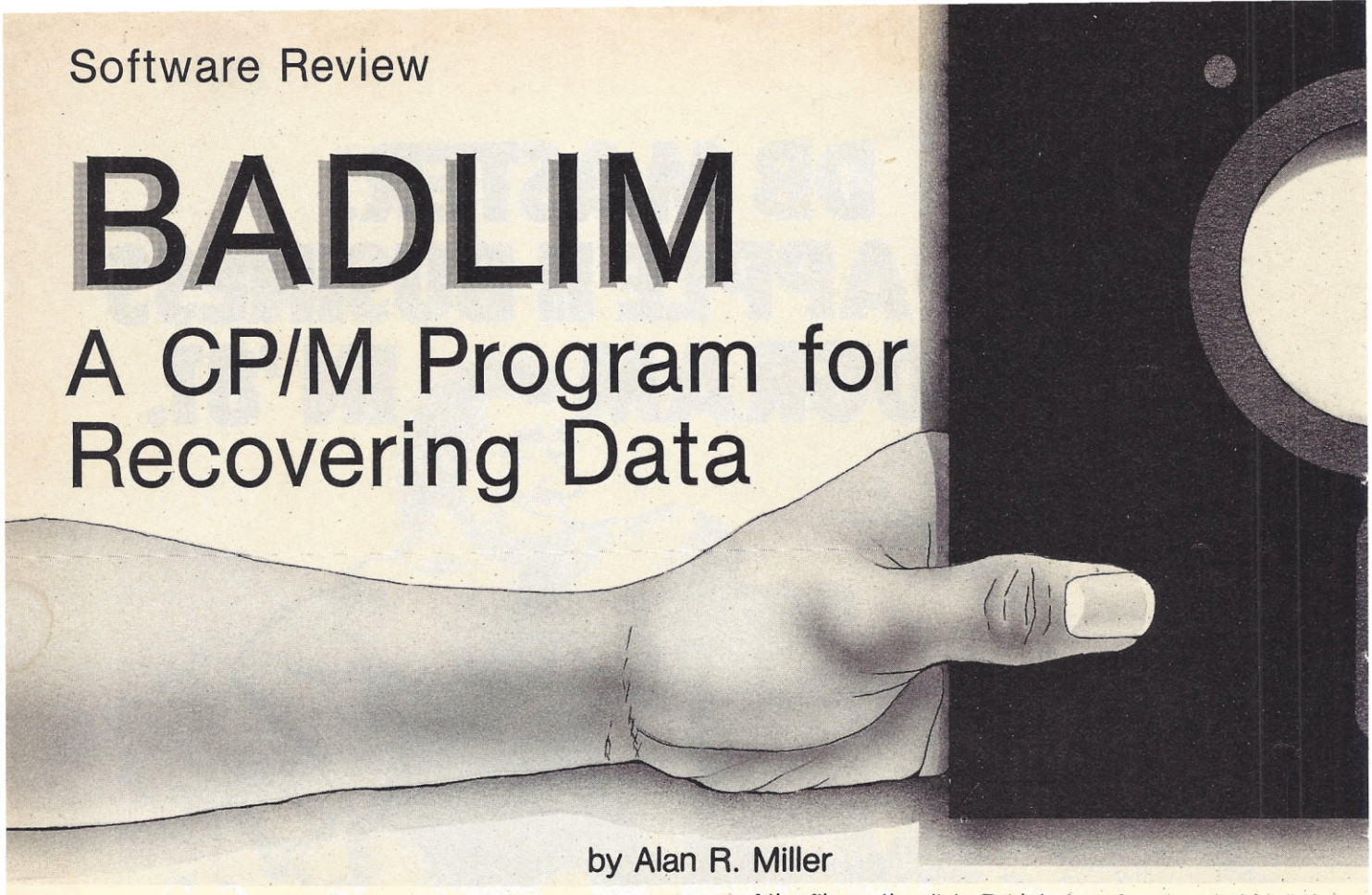
Software Review

BADLIM

A CP/M Program for Recovering Data



by Alan R. Miller

You've just put the finishing touches on a new computer program or a lengthy report. As you leave the editor, the words:

BDOS ERROR ON A: BAD SECTOR

appear on the console. This message indicates that CP/M was unable to read one of the sectors on the disk. The problem could be in either the new version or the old version of your program. It might also be in the editor or one of its overlay files. Blat Research and Development (Edmonds, WA) offers a program called BADLIM that can help with the problem.

Before we look at how BADLIM works, let us first review the operation of CP/M files. Both floppy disks and hard disks are partitioned into concentric regions called tracks. Tracks are further divided into wedge-shaped regions called sectors. Any program stored on disk will occupy one or more sectors. CP/M, however, groups a number of sectors into a unit called a block, the smallest disk unit it handles. Block sizes vary from 1K byte to 16K bytes, depending on the disk size.

The first two tracks of a floppy disk (tracks zero and one) are reserved for the operating system. The remainder of the disk contains the data. A directory, giving the location of each block of every file on the disk is located in the first data block or two, and every directory entry uses 32 bytes. For example, the first two directory entries might look like this

```
00 PAYROLL BAS 0100005F 0102030405060708090A0B0C0D0E00
00 SORT    COM 00000013 0F10000000000000000000000000000
```

The file named PAYROLL.BAS is shown first. The initial value of zero indicates that the file was created by user 0. The second file is named SORT.COM. The last 16 bytes of each directory entry show the location of the file on the disk. Each byte refers to one block. In the above example, the directory entry PAYROLL.BAS uses blocks 1, 2, 3, ... OE hex. SORT. COM uses two blocks, OF and 10 hex.

If we look at a disk allocation map we might see a pattern such as this:

```
11111111 11111111 11111111 11111111
11111111 11111111 11111111 11111111
11111111 11111111 11111111 11111111
11111111 11111110 00000000 00000000
00000000 00000000 00000000 00000000
00000000 00
```

Each symbol in this table represents one data block on the disk. A value of unity indicates the block is in use; a zero indicates the block is free.

If we erase the file PAYROLL.BAS, the corresponding blocks become available. The allocation map might now look like this:

```
10000000 00000001 11111111 11111111
11111111 11111111 11111111 11111111
11111111 11111111 11111111 11111111
11111111 11111110 00000000 00000000
00000000 00000000 00000000 00000000
00000000 00
```

In this example, the initial data block, with block number zero, is reserved for the directory itself.

If we could look at the directory again, we would see

```
E5 PAYROLL BAS 0100005F 0102030405060708090A0B0C0D0E00
00 SORT    COM 00000013 0F10000000000000000000000000000
```

Notice that the first byte for the file called PAYROLL. BAS has been changed from a value of zero to an E5 hex.

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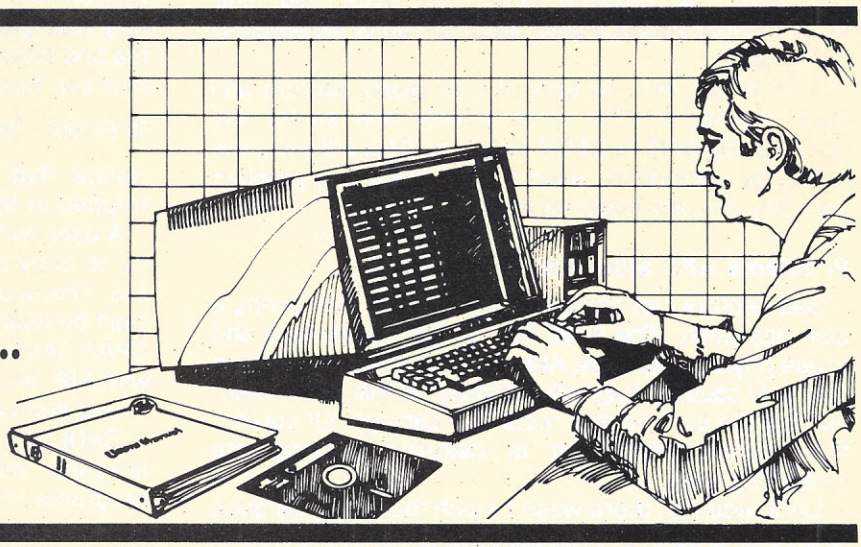

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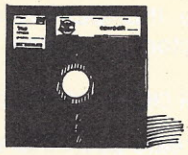

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This is what happens when a file is erased. However, the remainder of the directory entry has not been altered, and the actual data have not been changed.

Each time a sector of data is saved on the disk, a cyclical redundance check (CRC) is automatically written into the sector heading. The value is related to the information contained within the sector. When the sector is read back, the computer checks the data against the CRC. If there is a discrepancy, the information has probably been incorrectly read. The CP/M system issues a BAD SECTOR error message in this case.

A large file may be spread over many sectors and many blocks. A CRC error in only one sector will generate the BAD SECTOR message. This will make the entire file unreadable, even though there is a problem with only one small part of the file.

Problems with electrical failure

Bad sectors can occur if the electricity fails during a disk operation. The head may strike the surface and cause physical damage. Alternatively, the power failure may only cause a magnetic anomaly. In this case, reformatting the surface may repair the damage. Of course, the original information is destroyed during the formatting step.

Until recently, there wasn't much that could be done when a BAD SECTOR message appeared. In the case of a floppy disk, the best approach is to reformat the surface or discard the diskette. Hard disks, however, are another matter. They are usually mounted permanently and they are expensive.

Several programs are now available for dealing with bad sectors. One such program is Reclaim, Lifeboat Associates, New York, NY (*IA* Feb. 81). BADLIM is similar, but has some interesting new features.

When executed, BADLIM asks for the name of the drive to be checked. It then asks how many times a bad sector should be checked. It is possible that a good sector will be incorrectly read if dirt happens to get in the way. But the dirt may fall out and not be a problem on the next try. Consequently, it is common practice to re-read a sector five to 10 times before a bad sector is reported. Nevertheless, a single-read operation is available.

BADLIM then reads each sector of each track in sequence. It performs its readings directly through the basic input/output operating system, BIOS, rather than through the basic disk operating system, BDOS. This avoids system interruption when the program encounters a bad sector.

If BADLIM finds a bad sector during testing, the corresponding block number is reported at that time. At the test's conclusion, the number of bad blocks, if any, are reported. More importantly, if any files are using bad blocks, those file names are displayed on the console.

When the program finds bad blocks, it constructs a new directory entry with the file name BSBSBSBS.BSB. This entry is designated as a system file for user 15 and will be nearly invisible. The block map for this entry will designate the blocks containing bad sectors. For example, suppose that BADLIM found blocks 17 and 18 hex to be bad. It would create a directory entry such as

```
15 BSBSBSBSBSB 00000020 171800000000000000000000000000
```

But suppose that there was also a file called PAYOUT.BAS using these same blocks. The directory entry might look like this

```
00 PAYOUT  BAS 0100005A 161718191A1B1F20212223A6A7A800
```

This file uses 15 blocks, but two of them (blocks 17 and 18) are bad. BADLIM will correctly identify that PAYOUT.BAS is using the bad blocks.

The best way to correct the problem at this point is to delete this version of PAYOUT.BAS and copy a new version from another disk using PIP. The new copy will only use good blocks since the BADLIM is reserving the bad blocks for itself. The new directory entry might look like this

```
00 PAYOUT  BAS 0100005A 16191A1B1F20212223A6A7A8A9AA00
```

Notice that the bad blocks 17 and 18 have been skipped in this directory entry.

A user without a backup copy of a damaged file can try to copy it into memory with the debugger DDT or SID. This is done by changing disks, performing a warm start by typing a control-C, and saving the file with the CP/M SAVE command. Sometimes a copy is possible with PIP. In this way, all of the file except for the parts in bad sectors can be recovered.

BADLIM's power is that once bad blocks have been isolated, they will not cause trouble again. The programs not occupying bad blocks on the disk can be copied to another disk with PIP.

It is useful to run BADLIM frequently—at least once a day—and always after a power interruption or other unusual occurrence. If BADLIM is run a second time on a disk with bad sectors, it reports

```
FROM PRIOR CHECK BAD SECTOR IN BLOCK:
```

Thus it does not create additional entries for the same bad blocks. More importantly, it does not retest sectors previously found to be bad. This is especially useful on a flaky disk that sometimes gives errors. When BADLIM encounters the entry BSBSBSBS.BSB, it skips the corresponding blocks and does not test these blocks again.

RECLAIM isolates bad sectors into a special directory entry with the name BADSECA.XXX. The name is designated as a system file in user area 15. BADLIM has been programmed to recognize Lifeboat's name BADSECA.XXX and will skip over corresponding blocks.

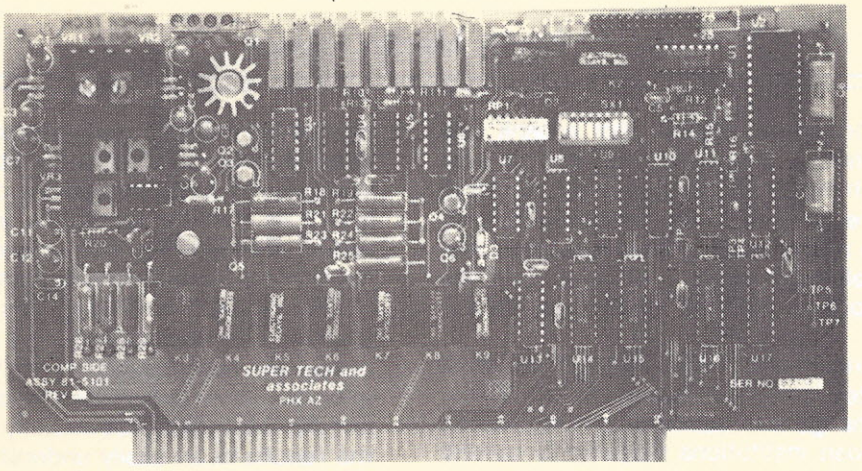
BADLIM makes changes only to the directory and does not write into the regular data areas. Version 1.2 will work on any CP/M version 2 since this version of CP/M contains BDOS and BIOS entries to the disk parameter tables describing the properties of the current disk. Those with CP/M version 1.4 can order a special version of BADLIM.

At New Mexico Institute of Mining and Metallurgy, we regularly run six different CP/M computers. For some reason, BAD SECTOR errors appear frequently on the system disk of one of these computers. We are able to monitor and correct this problem with BADLIM since it reports which files use the bad sectors. Another problem we encounter is frequent power interruption. When the power is restored, we immediately run BADLIM to see if a sector was damaged during the power failure.

A very careful, or very lucky, operator may not need BADLIM. Most of the rest of us, however, need it regularly. □

NEW PRODUCT
INTRODUCTORY OFFER

5101 DVOM
S-100 DIGITAL VOLT OHMMETER BOARD



- ☐ S-100 COMPATIBLE
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- ☐ DUAL A/D INPUT RANGES
- ☐ 4 WIRE OHMMETER CIRCUIT
- ☐ DUAL SLOPE INTEGRATION
- ☐ 4 INPUT DEVICE CONTROL LINES
- ☐ EXCELLENT DOCUMENTATION
- ☐ CONVERSION RATE OF > 10 CPS
- ☐ 6 PRECISION CURRENT SOURCES
- ☐ 11 OUTPUT DEVICE CONTROL LINES
- ☐ 26-PIN RIBBON CABLE CONNECTOR

S-100 COMPATIBLE ••• CP/M *programs available
DUAL A/D INPUT RANGES ••• 0-1.999 millivolts or 0-199.9 millivolts
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EXCELLENT DOCUMENTATION ••• including a diagnostics diskette and application notes

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Don't Let Interest Rates Dazzle You

by D. Martin Harrell

Not long ago, borrowing money from a bank was straightforward: interest rates varied only slightly from year to year, which meant that any loan officer could tell a borrower precisely what the probable monthly payment would be after merely checking a table. The transaction was relatively simple and quick, and the bank's formal approval seemed little more than a routine matter.

Things are different today. Since inflation has taken its toll, interest rates have skyrocketed. What's more, these rates now change with bewildering quickness as banks and other loan institutions respond to current events. A variety of new types of loans have appeared and interest rates vary widely, depending upon conditions such as down payment size and repayment period. By any of their intriguing names, these loans may mean danger for the unwary. Borrowing money has become a complex affair, with many variables to consider.

A borrower must deside which of these varied loan conditions is best for him. (For example, a high interest second mortgage can actually be cheaper than completely refinancing at a lower rate.) In dealing with floating interest rates, he must be able to determine at what point a rising interest rate might precipitate a personal financial crisis. And this must be done quickly, before loan offers expire.

The accompanying program for the TRS-80 model I or II might help. For many people, the affordability of a loan boils down to how much they must pay every month and for how long. The Basic program calculates and displays monthly payments. It does this in such a way that the user can readily assess the sensitivity of changes in monthly payments to changes in loan size, interest rates or payback period. As the user will see, variations in some conditions can have an enormous effect on monthly payments, while others have little effect. Recognizing these conditions might help you negotiate a more favorable loan.

Instruction Key	Meaning
A	Analyze another loan problem
I	Display Instructions again
Q	Quit, and do something else
X	EXpand the graphic display

Figure 1. Meaningful one-key commands are convenient to use and easy to remember.

This program is divided into three parts. The first displays user instructions, the second allows specification (or respecification) of the loan problem and selection of the item to be varied for sensitivity analysis, and the third calculates monthly payments and displays the results in an easily understood manner. The user can then choose to: (1) examine the results in greater detail; (2) analyze the loan under another set of conditions; (3) review the instructions, or (4) exit the program.

Examining the program reveals that it was designed with the user in mind. Instructions are concise. Any of the four commands shown is selected with a single keystroke and remembering them is not difficult (see figure 1). Not so apparent is the fact that the program will ignore the input if an operator presses any keys except those shown. (Of course, keys, such as BREAK, to which the operating system responds, still take precedence over those available to the program.)

When the instructions are first displayed, the "I" and "X" commands are meaningless. "I" merely repeats instructions. "X" is an instruction to expand nonexistent graphic display, a process that, at this stage, would involve an attempt to divide by zero. To prevent this, the program will actually ignore an "X" keystroke until the first loan problem has been analyzed. During program initiation, users will be prompted to select only the two meaningful commands by the prominently displayed instructions shown at the bottom of the screen. This prompting is absent in subsequent instruction displays, when all commands are valid. The instruction phase of the program can be exited only by keying a valid command.

The second part of the program consists of three sections and begins immediately after issuing an "A" command. The first task is selecting the problem variable (which mathemeticians will call the independent variable). This is followed by specifying values for the four elements needed to compute monthly loan payments—total cost of the purchased item or service, down payment, annual interest rate, and loan repayment period (in years); finally, the size by which the problem variable will be incremented (for sensitivity analysis) is chosen.

The display presented to the user aids in selecting the problem variable. At the top of the display are simple instructions, complemented by flashing one of

four boxes to the left. By typing "X", the user selects the element to the right of the flashing box as the problem variable and ENTER on the keyboard will move the flashing prompter down to the next box, and pressing "↑" will raise it one box. The program prevents moving the prompter above the top box or below the bottom one. The program will ignore all but these three keys, and users cannot accidentally omit selection because only typing an "X" can get them to the next step. Thus the program is designed to recognize and ignore input errors (except, perhaps, accidental selection of an unintended problem variable).

As soon as the problem variable is selected, the current values of the four elements appear immediately to the right of their respective titles. Any or all of these values may be changed or used.

As before, simple instructions appear at the top of the display, and a flashing box highlights the number that can be changed at the moment. Typing ENTER fixes the number and moves the prompter down to the next number, while typing a "↑" moves the prompter up. These two commands all return to correct numerical errors. This data updating is terminated only by typing an "X", which here stands for exit.

The program will recognize and refuse to accept most input errors at this stage and only positive numbers will be accepted. In spite of this, two errors can still be made; a number with more significant places than single precision can accommodate will result in rounding, and a zero value for the payback period leads to an attempted division by zero. I did not include corrective measures for the first of these because, while I doubt that many hobbyists would find such numbers realistic for personal loans, corporations might. The absence of such corrective action makes computation for larger loans possible merely by using a double precision data declaration.

Zero can be used

I did not attempt to prevent a zero payback period, because the same subroutines used for numerical entry at this stage could also be used for entering increment size at the next stage. There, a zero entry is acceptable.

"X" provides a dual function at this stage. It fixes the last highlighted number if ENTER did not immediately precede it and it causes the program to jump to the next stage: specification of the increment size for the chosen problem variable. (The purpose of this increment will become more apparent when assessment of the monthly payments is discussed.)

As shown in Figure 2, the display format for specifying the increment is quite similar to that used before. In fact, the only difference is that only one number is available for changing. This means that the prompter cannot be moved up or down. Other than this, though, the commands, the revision technique and the error prevention guards apply. Pressing "X" this time acts as before, but it also terminates the loan specification phase of the program since no terms need to be defined.

Figure 2 shows an example of the data definition process. There, total cost has been selected as the problem variable, and values for all four variables have been entered. The increment size has also been entered, but not yet fixed.

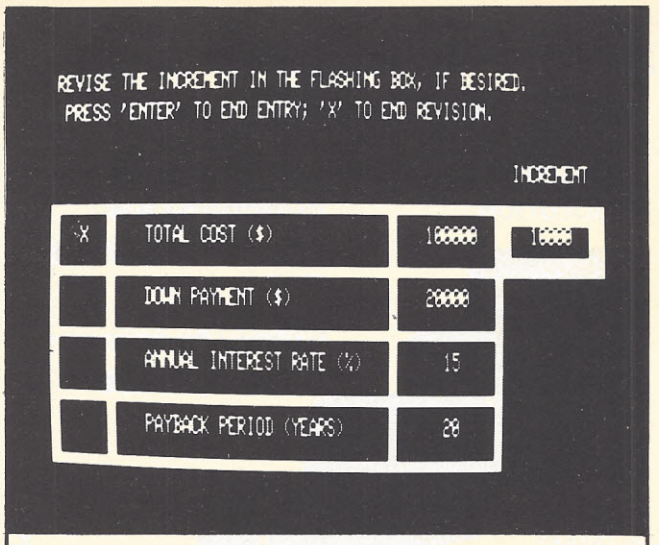


Figure 2. Defining the loan
The increment for the problem is typed into the flashing box, just as before. Typing an "X" fixes this value and moves the program into the analysis display stage.

The last phase of the program begins by calculating the monthly payment for the specified problem. It is done using the equation

$$P = \frac{S\ i}{1 - (1 + i)^{-n}}$$

where P = monthly payment
S = initial sum of the loan
i = interest rate
n = number of repayment periods

In this case, computation to prepare the data is needed before this formula can be applied. First, the loan amount must be found by subtracting the down payment from the cost of the desired item or service. In addition, the interest rate and number of repayment periods must be changed from the units used for entry to a common base. (Recall that annual interest rate and a repayment period measured in years were used for entry because we generally think in these terms; however, computation of monthly payments requires these to be restated in terms of monthly interest rates and number of monthly periods.)

The computed results appear only moments after completing problem specification. A typical example is shown in figure 3. At the top of the display are the conditions previously selected for the particular problem being analyzed. What is displayed in this heading depends upon which variable is chosen to be the independent variable and which ones, as a consequence, remain fixed.

The results appear in tabular form. Eight different values for the independent variable, separated by the specified increment, form the left column of the table. The column heading is an abbreviated form of the title of the variable.

To the right are corresponding monthly payments needed to retire the loan in equal installments over the

term of the loan. (Just as your bank officer must do, you must separately calculate the size of the last payment; it will be close to, but rarely the same as the others.) These payments appear in two coincident forms—a horizontal bar followed by the payment in numerical form. The length of the bar is proportional to the size of the installment.

With this display, the relative merit of a loan under the specified conditions can be determined. The proportional bars are particularly helpful in this respect, for they can be used to determine the sensitivity of the monthly payments to variations in the independent variable. For example, if an imaginary line connecting

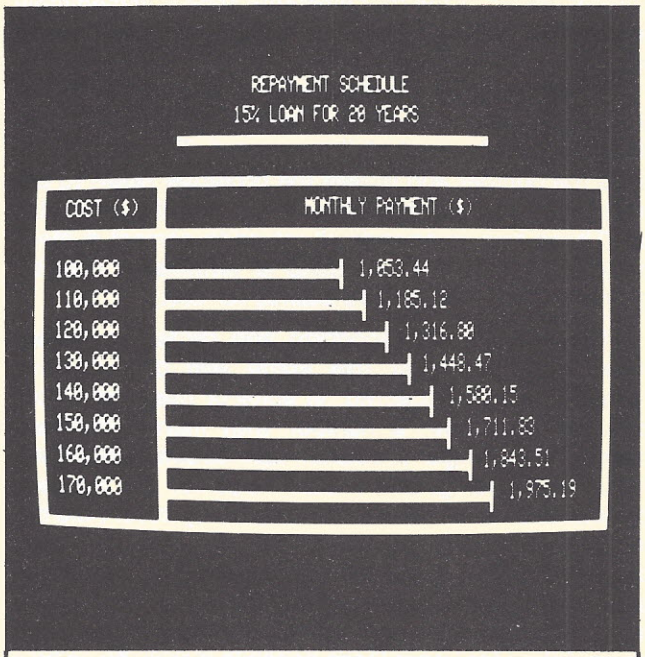


Figure 3. Monthly loan payments
The display in this photograph shows the monthly loan payments for the loan defined in figure 2. The length of the bars help show the effect of variations in the problem variable, "cost", at the left.

the right hand ends of these eight bars is straight (as in figure 3), there is a linear relationship between the monthly payment and the independent variable—at least in the region under examination. This means that equal changes in the independent variable (cost, in this case) at any two starting values within this region will produce equal changes in the monthly payment.

On the other hand, the imaginary line sometimes shows that required payments decrease sharply for changes in small initial values of the independent variable (particularly when it is "payback period"), but rather slowly for equal changes in large initial values. In this situation, there is a decided advantage to negotiate forcefully to increase the agreed payback period when the initially offered period is small; however, this is a case of diminishing returns.

At this point, users must instruct the computer what to do next. All four of the instructions shown in figure 1 are valid. Probably the most frequent choice is to enter an "A" command to respecify any or all of the problem data to re-examine the loan under different circumstances. If this is the case, you must then redefine the

independent variable. You may also revise any problem data that change, but you need not re-enter values that won't change.

"X" expands the graphics portion of the computed results to make any curvature of the imaginary line more discernible. You might consider it a magnifying window that eliminates all but the ends of the eight bars. This command is particularly useful when a situation involving only slight curvature of the imaginary line is encountered.

Reviewing the program, we will focus more on how it was written than on the particular problem (loan evaluation) addressed. By doing this, some general guidelines useful for other programs can be extracted. Specifically, note that this program was designed for clarity—so someone other than its author can easily understand how it works and readily modify it to match another computer or use; ease-of-use—so both beginners and experts feel confident in applying it efficiently, and error avoidance—to eliminate the garbage-in/garbage-out problem often associated with computers.

At first glance, the program might not look structured, but it is. The problem lies with Basic, which, unlike better languages such as PL/1, was not designed for structured programming. If the comments imbedded in the listing are separated from the code and reordered to show the execution sequence, the structure becomes more apparent. Also, as an aid, the last digit of the line numbers of these comments indicates the subroutine level of the code that follows—at least for the first encounter. (Note, for example, that the box-drawing subroutine of lines 243-290 first appears as a third level subroutine, but then is used extensively at different levels throughout the program.) These features, combined with the meaningful variable names (see comments in listing), should make understanding this code relatively easy for others.

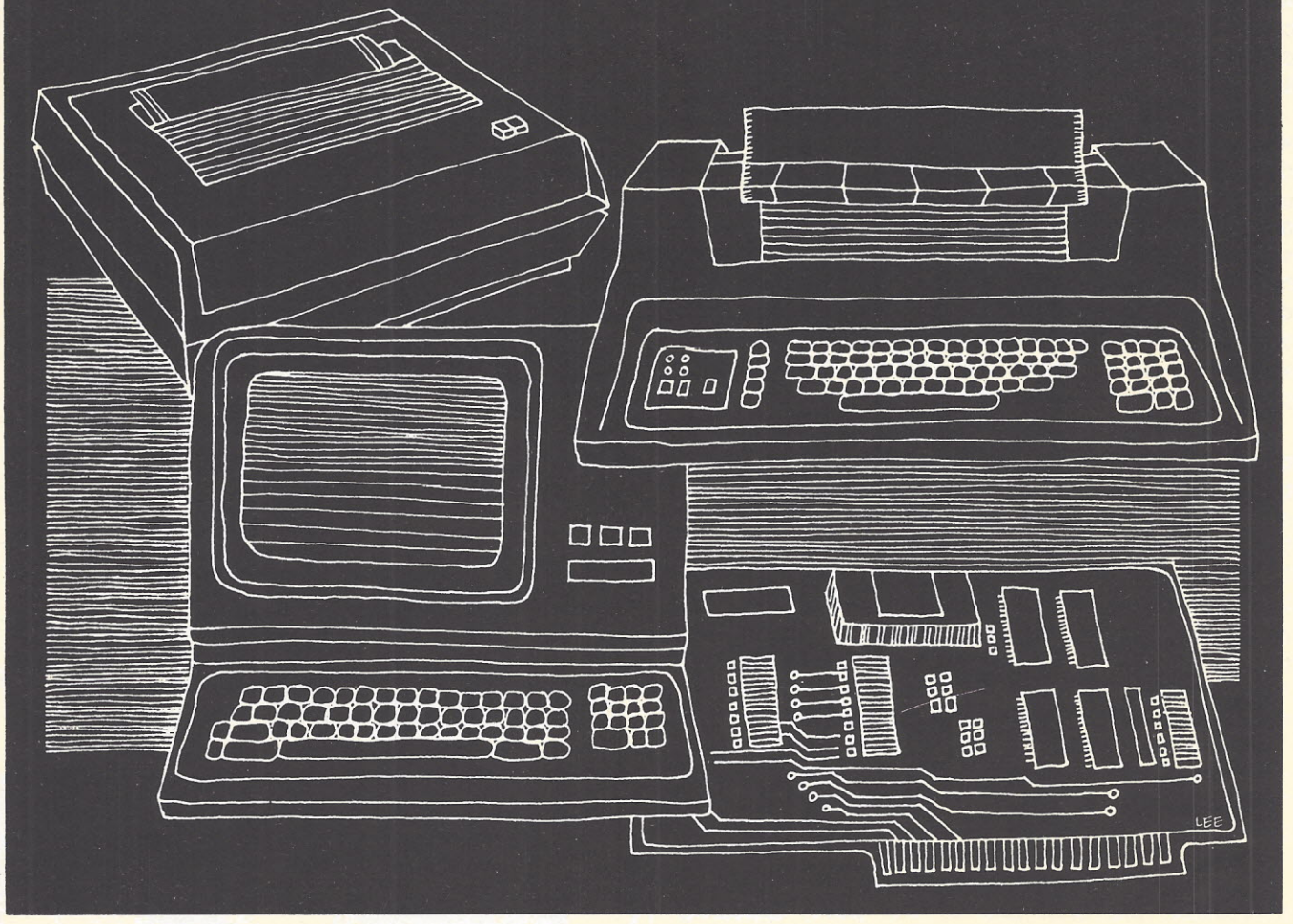
From a user's viewpoint, simplicity prevails throughout. Instructions are brief and to the point, appearing progressively and only when needed. They are sufficient for a new user, yet they neither detract nor slow an experienced one. Revising problem data for another analysis takes but seconds because only changes need be entered from the keyboard. These changes are automatically stored properly in memory due to their positional relationship to the flashing prompter. The combined result is that the program is as quick and easy to use as its display is pleasing to the eye.

Finally, the program is designed to avoid inadvertent errors. It simply refuses to accept most of them when they are made. It cannot detect numerical errors, but the probability of these is lessened by allowing familiar units for data entry, rather than requiring those needed for computation. Moreover, if such errors are made, it is an easy matter to back up and correct them.

The result of these considerations is a program that is quite easy to use. With it, you can determine the effects that changes in loan size, interest rate and repayment period will have on monthly loan payments. This won't necessarily enable you to negotiate a better loan, but it certainly gives you information that will help. In this respect, you might even find yourself better prepared than your loan officers. □

Program on page 154

NEW PRODUCTS DIRECTORY



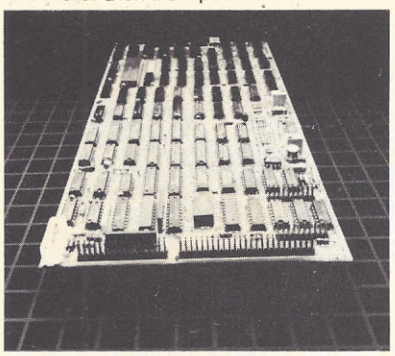
HARDWARE

SOFTWARE

HARDWARE

CPU/MEMORY

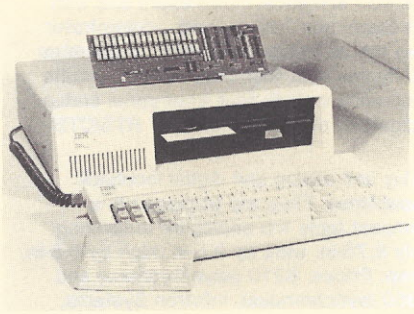
Intelligent disk controller, model 20A, is designed to control up to two Seagate interface compatible 5¼-in. disk drives or their functional equivalents. It is a single 5.75 by 11.5-in. PCB designed for physical compatibility with the Seagate drives and plug compatible at the host interface level to DTC 500 series and Omti 10 series controllers. Disk I/O operation are done via



buffering to support varied host transfer rates. The controller command set includes a multiple sector transfer capability for reading or writing up to 256 sectors in one operation, a 512-byte sector option, fast seek capability for the ST506, and sector interleaving to optimize host throughput. Price: $595. Omti, 2165 S. Bascom Ave., Campbell, CA 95008, (408) 377-1521.
CIRCLE INQUIRY NO. 220

Bipolar microprocessor slice, Am2901C, is an industry-standard 4-bit unit containing a two-operand, eight-function arithmetic/logic unit (ALU), a 16 by 4-bit dual-port random-access memory and shifting logic. The Am2901C is plug-compatible with its previous versions. It is the centerpiece for many other bipolar, IMOX-processed integrated circuits. Included in the family are the Am2903 microprocessor, the Am29203 microprocessor and the Am29116 microprocessor. Additional support for the family is provided by a variety of arithmetic products, micro-program control products, program control products, direct-memory access products, error detection and correction products and other integrated circuits. Prices: ceramic, $11.15, plastic, $8.65. Advanced Micro Devices, 901 Thompson Pl., Sunnyvale, CA 94086, (408) 732-2400.
CIRCLE INQUIRY NO. 221

Memory module, CI-PCM, is designed for IBM's PC using 64K-bit NMOS dynamic RAM technology. It requires only one I/O expansion slot for 256K bytes of memory. The CI-PCM generates and checks parity with Interrupt totally IBM compatible. It is addressable in 64K byte increments throughout the 1M-byte address field of the IBM system. The memory has an access time of 225 nS and a cycle time of 400 nS with a total current requirement of under 1 amp from the system 5-volt power supply. The CI-PCM is available in 64K-, 128K-, 192K-, and 256K-byte configurations. Price: $895. Chrislin Industries, 31352 Via Colinas #102,

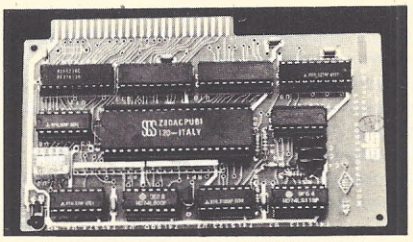


Westlake Village, CA 91361, (213) 991-2254.
CIRCLE INQUIRY NO. 222

16K/32K-byte RAM board, #H216, adds 16K bytes to an Atari computer system. After the Atari user has exhausted the potential of 16K bytes, upgrade to 32K bytes is easy using the upgrade kit #H212. This product is of particular interest to owners of the Atari 400 with 16K bytes, the Atari 800 with 16K bytes, and the Atari 800 with 32K bytes. Mosaic Electronics, P.O. Box 748, Oregon City, OR 97045.
CIRCLE INQUIRY NO. 223

Single board central processor, CPZ-48000, is intended for users requiring a high degree of versatility and sophistication to configure systems for applications ranging from research and development, business systems and scientific applications to home computers. It features Direct Memory Access, Vectored Interrupt and 16M-byte Memory Management Processing. Features include: IEEE S-100 bus-compatible; Z80A/4Mhz-based; two serial I/O ports (one with DMA); two parallel I/O ports (one with DMA); dual density/double sided floppy disk controller with DMA; Direct Memory Access (4 channels; 1 channel for the S-100 bus DMA); 64K Dynamic RAM, bank-selectable in variable windows set by software; two or four Kbyte EPROM with Comprehensive Monitor; eight-vectored priority interrupts plus serial and parallel port interrupts and others; software selectable baud rates; memory management unit with addressing range of up to 16M bytes; on-board timer; synchronous or asynchronous operation for SIO channels; CP/M and MP/M Disk Operating System Compatible; and Turbo-Disk implementation included. International Micro Systems Corp., 1733 S. Douglass Rd., Suite E, Anaheim, CA 92806, (714) 978-9758.
CIRCLE INQUIRY NO. 224

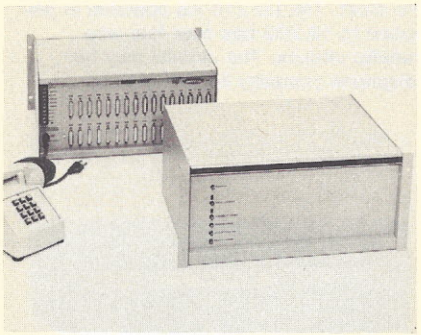
Interface unit, plug-in Z-Card, allows Apple III to use CP/M (in conjunction with SOS). The Z-Card contains its own Z-80A microprocessor, allowing the Apple to run virtually any software designed for CP/M-based microcomputers. It is installed with no hardware or software modification, and therefore does not violate the Apple warranty. Once the card is installed, users can switch back and forth between CP/M and DOS or SOS using simple software commands. Synergizer Software, the CP/M operating system delivered with the Z-Card, includes an enhanced directory command, format and copy in one pass, and use of a full 60K bytes of system RAM. The Z-Card allows Apple owners to take advantage of CP/M and run many popular software packages including Wordstar, CBasic, VTS/80, Accounting Plus, and Supercalc. The card is also fully compatible with ALS's Smerterm 80-column display board and Add-Ram



16K-byte RAM board for the Apple system, which can further increase capabilities. ALS, 1195 E. Arques Ave., Sunnyvale, CA 94086, (408) 727-6805.
CIRCLE INQUIRY NO. 225

DATA COMMUNICATIONS

Data multiplexer, Teltone M-825, is compatible with standard telephone T1 Digital Carrier transmission systems. It can also be used in private data networks over four wire (two twisted pair) circuits. The multiplexer is designed to accommodate 32, RS-232C compatible, asynchronous, full duplex data sources, with a maximum rate of 9600 bps on all ports simultaneously. The time division multiplexer is transparent to the user in both data rate and protocols used, and allows any data rate on any port from 0 to 9600 bps without modification of port characteristics (either by switches or by an external controller). The design also provides single bit error correction for



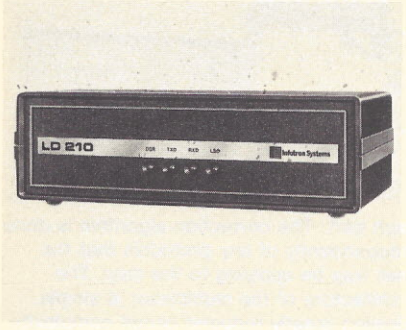
each port. The correction algorithm is done independently of any protocols that the user may be applying to the data. The architecture of the multiplexer is simple, allowing greatly reduced circuit complexity compared to conventional TDMs and relatively low power consumption. Built-in transmitter and receiver circuitry, designed to T1 specifications, eliminates the need for external line drivers. Data communications managers can plan a local network that takes advantage of multiplexer capabilities to reduce cable

lease costs and to overcome cable facilities shortages. Price: $3,200. Teltone Corp., Box 657, 10801 120th Ave. N.E., Kirkland, WA 98033, (206) 827-9626.
CIRCLE INQUIRY NO. 230

Interface device, the OCP-series Office Communications Processor, enables incompatible word processing as well as other office automation systems to communicate. The device allows multiple simultaneous communications, to maintain full format parity between the sending and receiving systems and to translate error correction routines. From an operator's perspective, the unit serves as a compact, desktop communications switchboard whereby dissimilar word processors, data processors, typesetters, intelligent copier-printers and other information handling

systems can be linked together in any combination by simply punching a few buttons on the control panel. The technical tasks of protocol translation, code conversion and determining transmission disciplines are performed automatically. Prices range from $5,995 for the OCP/44 to $7,495 for the OCP/88. The cartridges containing the software for each device with which you wish to communicate are purchased separately at $500 each. G.O. Graphics, 179 Bedford St., Lexington, MA 02173, (617) 861-7757.
CIRCLE INQUIRY NO. 231

Line drivers, LD 210 AS (asynchronous) and LD 210 SA (synchronous) provide alternatives to conventional modems in installations where transmission distances are short. The LD 210 AS operates at any speed to 19,200 bps over four-wire metallic circuits. The circuits may be telephone company lines or private

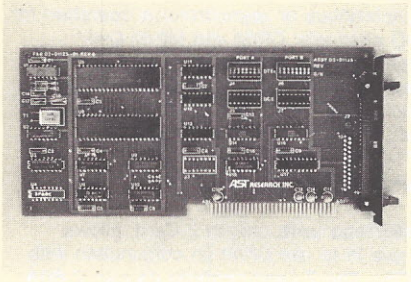


facilities. Transmission range is a function of wire size and data rate. The unit presents an RS-232C interface to terminals and front-ends and conforms to Bell publication 43401 requirements on the line side. It emulates a conventional modem and may be used in most applications that do not require the Ring Indicator (RI) control signal. The LD 210 SA is designed for use with Infotron Supermux 480, 680 and 780 statistical multiplexers and with the Supermux 790 network concentrator. Like the asynchronous model, it operates full-duplex over four-wire metallic circuits. Both units include four front panel status indicators, switch selection of RTS/CTS

delay and analog and digital loopback capabilities. They are packaged in a compact table top enclosure measuring only 8.75-in. wide by 2.5-in. high by 6.5-in. deep. Prices: $210 (asynchronous) and $350 (synchronous). Infotron Systems, Cherry Hill Industrial Center, Cherry Hill, NJ 08003, (609) 424-9400.
CIRCLE INQUIRY NO. 232

Synchronous multiplexer, OMX-9608, provides full-duplex data transmission, on all eight channels, to speeds up to 19.2K baud. Data transmission on all channels can be either asynchronous or synchronous, programmable from the front panel keyboard. The operating speed of each channel can be independently programmed at internally clocked synchronous mode speeds of 1200, 2400, 4800, 9600 or 19.2K baud, or externally clocked synchronous or asynchronous modes, transparent to baud rate. Constant monitoring of the optical link (data set and fiber-optic cable) operational status is provided with both an audio and visual LED status indicator. Automatic data transmission shutdown will occur (if the optical link fails) to prevent loss of data. Remote loopback testing of data, on a channel by channel basis, is provided under computer control. Local loopback testing of data is provided by the front panel keyboard control on a channel by channel basis, thus providing simple fault locating for ease of maintenance and troubleshooting. The unit is available in either a stand-alone or rack-mounted version. Unit price is $2,700. Phalo/O.S.D. Corp., 9240 Deering Ave., Chatsworth, CA 91311, (213) 998-3177.
CIRCLE INQUIRY NO. 233

Expansion memory cards increase capabilities from 64K bytes to 256K bytes. They come fully socketed for easy user-upgrading. All cards are fully



assembled, tested and burned-in. Parity checking is standard. Prices range from $495 to $1,145. AST Research, 17925 Sky Park Circle, Suite B, Irvine, CA 92714, (714) 540-1333.
CIRCLE INQUIRY NO. 234

Modem, HP 8295A series 80, plugs directly into any of the four ports in the back of the Hewlett-Packard personal computer and has two jacks for direct connection to the phone line and the telephone system. This configuration offers more noise immunity than acoustic couplers, while still permitting voice communications. The modem is Bell 103-compatible with auto-dial and auto-answer features, and operates at from 50 to 300 baud. The software that accompanies the modem supports all these features, including automatically logging on, re-dialing, self-testing, maintaining a phone directory, setting up configuration files which set frame parameters (parity, echo, etc.) and transferring files. These features are all accessible through soft-key-guided menus.

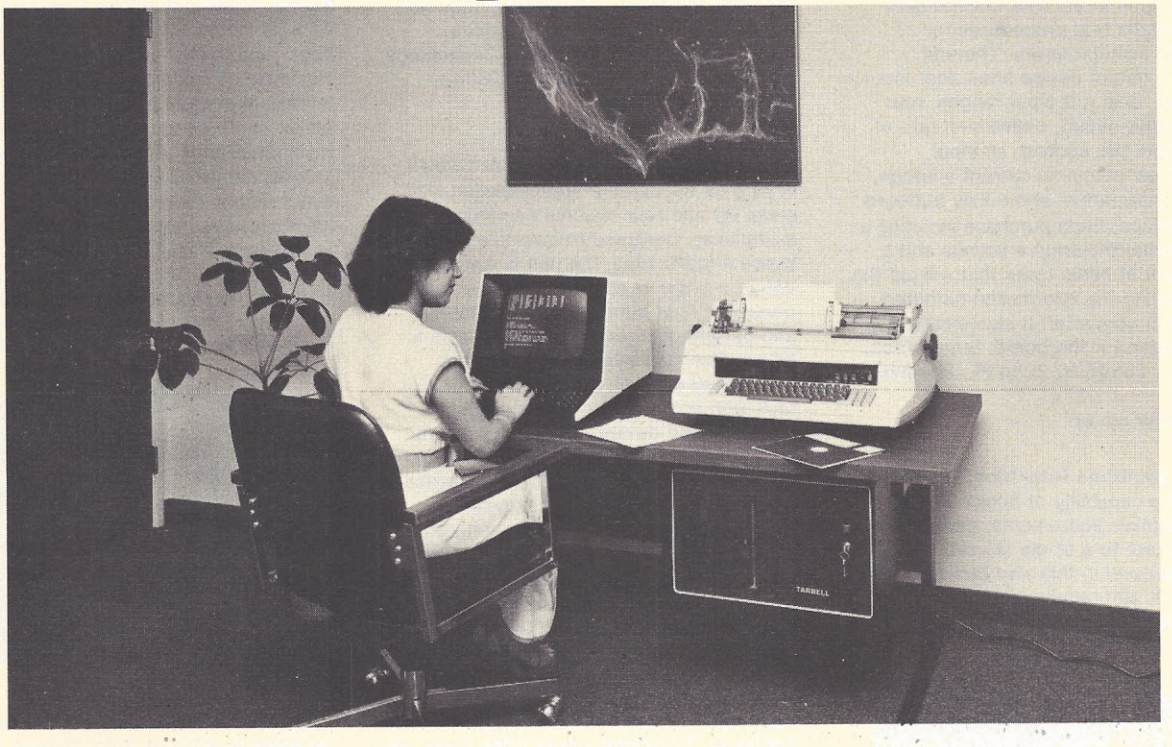
For example, pressing the dial soft-key, the user is prompted for a phone number or name. If a name is entered, a search of mass storage is made and information relating to the name is loaded and executed. The information may include the phone number, the communications protocol and the log-on sequence required by the host. Price: $395 (U.S.), including phone cord, software and owner's manual. Hewlett Packard, 3000 Hanover St., Palo Alto, CA 94304, (415) 857-1501.
CIRCLE INQUIRY NO. 235

Originate/answer modem, MFJ-1230, is used like an acoustic coupled modem, but employs an innovative inductive coupling technique for receiving. This gives more reliable data transfer by eliminating errors caused by room noise, vibration and a host of other acoustic coupling problems. This modem operates 0-300 baud, features half and full duplex operation and is crystal-controlled for very high stability. It provides TTL and CMOS inputs/outputs as well as RS-232 compatibility. This allows easy interfacing to nearly any computer with proper software. Also, input/output ports for a cassette tape recorder lets you save your transmitted data and load it back to your computer or retransmit it later. The black low profile all aluminum cabinet measures 4 by 1½ by 9½-in. It is simple to install and operate and is compatible with nearly any standard data terminal or personal computer. Price: $129.95 plus $5.00 for shipping and handling. MFJ Enterprises, 921 Louisville Rd., Starkville, MS 39759, (800) 647-1800.
CIRCLE INQUIRY NO. 237

INPUT/OUTPUT

Expansion board, 5101 DVOM, is for S-100 bus, CP/M operating systems. It is designed to control and interface an

Move Up to Tarbell



The Serious Business Machine

Do you have a small computer system that operates with mini-floppies and has limited storage capacity? Then it's time to move up to the Tarbell Empire Series System. Tarbell starts where small systems leave off, providing storage from 1 to 20 megabytes. This means Tarbell is capable of growing right along with your business. (It also makes sense to start with Tarbell if you're a first-time computer buyer.)

Tarbell is the serious general purpose business machine, backed by years of experience with disk systems. It gives you word processing, inventory control with bill of materials, mailing lists — all in addition to accounting applications: general ledger, payables, receivables, payroll with cost accounting and order entry. Whatever your need may be, Tarbell can provide the working software that gets the job done.

With the Tarbell System you get a Z80 4 Mhz CPU with memory management, timer and full interrupt capability, 2 RS-232 serial ports with handshaking, 64 K bytes of random-access memory, double density floppy disk interface, 2 double density floppy disk drives, cabinet, power supply, and cables.

The software includes: CP/M™ 2.2 disk operating system, Tarbell Disk BASIC, Tarbell Database System, and all manuals and documentation.

Tarbell also offers the MP/M™ Multi-User Operating System and 4 additional RS-232 serial ports.

The Tarbell Empire Series is delivered assembled, tested, and with a FULL six-month warranty on parts and labor.

And when you need even more mass storage, Tarbell also has a hard disk that's system-compatible and provides easy back-up.

If your business is growing or you need more than a few hundred K bytes — it's time to move up to Tarbell. Call your local Tarbell dealer for competitive prices.

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950 Dovlen Place, Suite B
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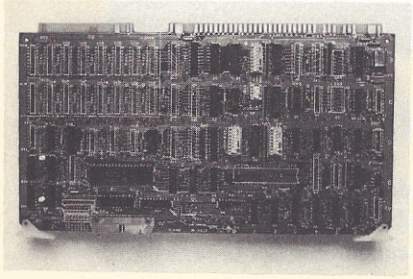
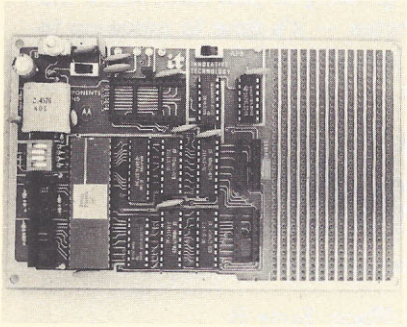
integrated voltmeter directly to the system bus, allowing the user to take resistance and ohmmeter readings and incorporate them into a computer information field for further data information or control. It is compatible with the S-100 bus, and has been working in a real time environment doing automatic test procedures for pyrotechnic manufacturers. The unit features 11 output device lines, four input device lines, dual A/D input ranges, four wire ohmmeter circuit, conversion rate of 10 characters per second, an input attenuator, six precision current sources, dual slope integration, and a fully buffered S-100 interface. Each purchase includes a diskette containing source listings and a macro library of basic tasks that will aid the user in utilizing the information gathered from the A/D converter. It also includes full documentation for the board. Super Tech and Assoc., 15845 N. 22nd Pl., Phoenix, AZ 85022.
CIRCLE INQUIRY NO. 241

IEEE 488 Multibus interface, ZT 85/18, provides the capability of hooking multiple GPIB compatible instruments, peripherals and computers to a single I/O slot. A system equipped in this way can direct the operation of, and receive data from attached devices. This interface can be



used in any Multibus compatible system including 8086- and 68000-based systems. Support for the ZT 85/18 includes software driver routines, manual, cable and phone-in consulting service. Price: $595. Ziatech Corp., 3433 Roberto Ct., San Luis Obispo, CA 93401, (805) 541-0488.
CIRCLE INQUIRY NO. 242

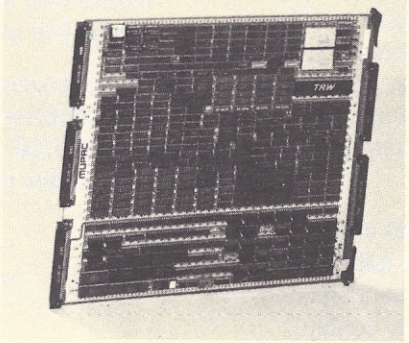
Applications prototype board, APB, supports the MC6801 family of microcomputers. A typical 6801 member contains an enhanced 6800 processor, 2K



bytes of ROM, 128 bytes of RAM, a 16-bit programmable timer, parallel I/O, and a serial communications interface. In addition to the resources of the 6801, the APB provides an additional 2K bytes of EPROM (TMS2716), 2K bytes of RAM(2114L), and a full duplex RS-232 interface. It also supports special versions such as the 6801G1 with its Lilbug monitor; and provides on-board programming of the 68701 EPROM version. The APB comes with over 50 pages of documentation and is available in four different versions. Prices: $19 - $129. Innovative Technology, 510 Oxford Park, Garland, TX 75043.
CIRCLE INQUIRY NO. 243

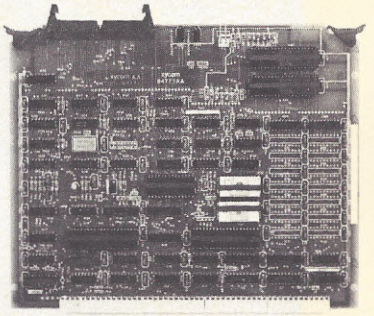
Analog-to-digital converter, ADC0833, is an 8-bit successive approximation with serial I/O and four channel configurable multiplexer. Designed to minimize board space and I/O lines, the unit is suited for use in a range of applications including the control of heat pumps, audio turntables and battery chargers. Conversion time is 80 μs. The converter features a total unadjusted error of $\pm 1/2$ LSB and ± 1 LSB with no full-scale or zero adjust required. The device requires low power for operation—only 15mW—obtained from a single supply voltage of 5V. An internal zener diode, however, can provide regulated power from a higher voltage source. ADC0833 possesses three inputs: chip select, clock and data-in, which defines the multiplexer configuration and channel assignment and initiates conversion. All logic inputs and outputs are compatible with TTL and MOS circuits. The multiplexer of the ADC0833 is controlled with a 4-bit serial input word to configure the analog inputs three ways: as four single-ended inputs, two differential input pairs or a combination of both. National Semiconductor, 2900 Semiconductor Dr., Santa Clara, CA 95051, (408) 737-5000.
CIRCLE INQUIRY NO. 244

Real-time signal processor, AR-40, makes possible I/O rates in excess of 4 million words per second. The arithmetic section provides logical and arithmetic operations (including multiply) at a 4.6 MHz rate. Address computations are performed at a 13.8MHz rate in a separate addresser ALU. That lineup provides 1024-point complex FFTs in 9.2 mS and second order filter stages in 2.2 μs. Coding the AR-40 has been made friendly through its support by a logical assembly language and a



relocating assembler and cross-linker. Debugging new code is assisted by AR-SCAN, a logic analyzer add-on, which lets you see what's happening inside the machine as it crunches away in a real-time environment. The AR-40 features a full set of data-dependent operations, flexible addressing and true ease of programming. It also has on-board A/D conversion (12 bits at up to 200 KHz) and IEEE-488 or RS-232 interfacing. Adams-Russell Digital Processing Div., 1370 Main St., Waltham, MA 02154, (617) 891-4700.
CIRCLE INQUIRY NO. 245

Serial communications controller, GPSCC model 1847-plus, allows host-to-host, host-to-four targets, or host-to-four terminals communications. The Z-80 based intelligent module offers four channels of either asynchronous or bit synchronous communications. Each channel may be independently configured in bit synchronous record mode (SDLC), asynchronous record mode or asynchronous character mode. All four channels have on-board variable size buffering, on-board or external baud rate generation, and all four may be operated simultaneously. When programmed in the



SDLC mode, the 1847-plus transmits and receives records or SDLC frames. In asynchronous record mode, records are separated by user defined record terminators. In character I/O mode, characters are sent and received one character at a time through a character buffer located anywhere in system memory.Xycom, 750 North Maple Rd., Saline, MI 48176.
CIRCLE INQUIRY NO. 246

MISCELLANEOUS

Precision laboratory integrator, Applegrator II, is designed for commercial testing laboratories. This microprocessor-based instrument features specific applications software for chromatography, spectroscopy, colorimetry, and flow measurement, as well as general-purpose software for pulse integration and data acquisition. Professional reporting, extensive use of video graphics, floppy disk storage of raw data and results, interrupt-driven sampling, and thorough documentation are primary features. the instrument includes a sixteen channel, high speed, twelve bit analog-to-digital (A/D) convertor and precision timer. It can sample waveforms at rates up to 20 Khz (50 μsec) and store up to 10,000 data points. While sampling, the Applegrator also plots the data on the video screen and computes the true sum and sum of squares for each channel. After sampling, data may be reviewed in either expanded or compressed form. Integrals of selected portions of the sampled waveform may also be computed. Peak detection routines allow reporting of peak heights, width, areas and retention times (or frequencies).

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Dynamic Solutions Corp., 61 S. Lake Ave., Suite 309, Pasadena, CA 91101, (213) 577-2643.
CIRCLE INQUIRY NO. 251

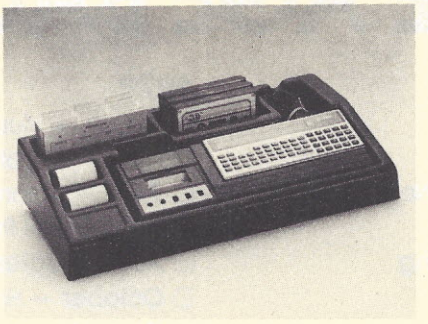
Workstation, Station II, organizes, simplifies, secures and lets the user control access to his Apple. The product makes Apple II and peripherals a single, integrated unit. The unit creates an integrated system that allows the user to get inside his Apple without unstacking and restacking peripherals. It also clears the work station of electrical cords and cables,

because Apple, monitor and another peripheral plug into Station II's built-in power outlets. One cord and one wall plug power the system. A line voltage surge suppressor prevents the loss of a program due to a power surge. Trace Systems, 1928 Old Middlefield Way, Mountain View, CA 94043, (415) 964-3115.
CIRCLE INQUIRY NO. 252

Intelligent desk blotter, the Image Data Tablet System, provides relatively untrained staff direct access to the company computer through handwritten entries, sketches, drawings and an alphanumeric touch table for mathematical problems, calculations, teletype and user-selectable programming functions. The ¼-in. thick tablet and its associated character recognition are useful in a wide range of industrial and commercial

applications. A unique feature is the forms-handling capability. The system takes any existing document up to 11.75-in. square—whatever the layout and including NCR or multiple copies—and enters it into a host computer or its own optional microprocessor as the form is filled out, resulting in a hard-copy original identical to the computer entry. Total Technical Services, 341 Cobalt Way, Suite 208, Sunnyvale, CA 94086, (408) 733-5211.
CIRCLE INQUIRY NO. 253

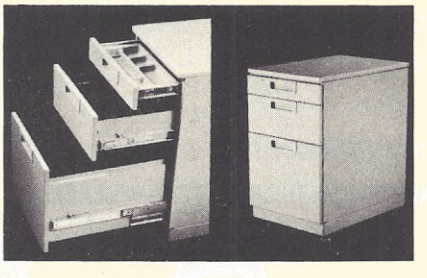
Pocket computer desk console is for the Sharp PC-1211 and TRS-80 pocket computers with printer. Made of black plastic, measuring 8.5-in. by 16-in. by 2.75-in., each has room for three cassette



boxes, a full set of 3-by-5 cards, two paper rolls, a spare print ribbon and the interface cable. Price: $19.95. Fox Walker, 4650 Arrow Hwy., Bldg. G-17, Montclair, CA 91763, (714) 621-3400.
CIRCLE INQUIRY NO. 254

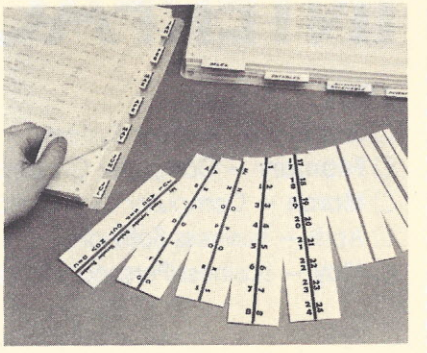
Graphics upgrade for LA120, Decplot, is a plug-in electronic module, providing a precision dot addressable plotting feature over the entire page, while maintaining the reliability of the conventional text printing mode of the DEC LA120 terminal printer. Decplot software is compatible with most Digital Equipment graphic terminal products, as well as with Texplot, the portable graphics terminal based upon Texas Instruments "Silent 700" equipment. Only three simple commands, and none of the ASCII control charcters, are required for plotting. Therefore, existing software programs may be modified for graphics without rewriting systems software. Decplot is also compatible with ISSCO's popular Disspla and Tell-a-Graf, and many computer timesharing services. Price: $595. Texprint, 8 Blanchard Rd., Burlington, MA 01803, (617) 273-3384.
CIRCLE INQUIRY NO. 255

Mobile pedestal file features an anti-tip fifth wheel base, which prevents tipping when a loaded drawer is fully opened. The pedestal can be used under any panel support, work surface or information



processing station. It is also available without top or base for mounting under freestanding desk or table. All file drawers are full extension and removable. Structural Concepts Corp., Spring Lake, MI 49456, (800) 253-5102.
CIRCLE INQUIRY NO. 256

Computer data tabs are a new way to index and organize your computer data printouts. Use with burst and unburst forms. They are pressure sensitive and attach to the side or bottom edge of a report. Choose Write On, Type-On or Pre-Printed (months, alphabetical and numbers 1-31) tabs for frequently used titles.

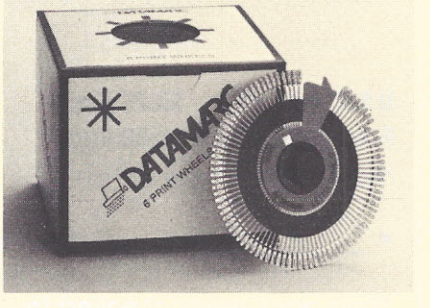


Available in convenient 1-in. size with a color edge for easy identity. Tabbies, 1530 West Glenlake Ave., Itasca, IL 60143.
CIRCLE INQUIRY NO. 257

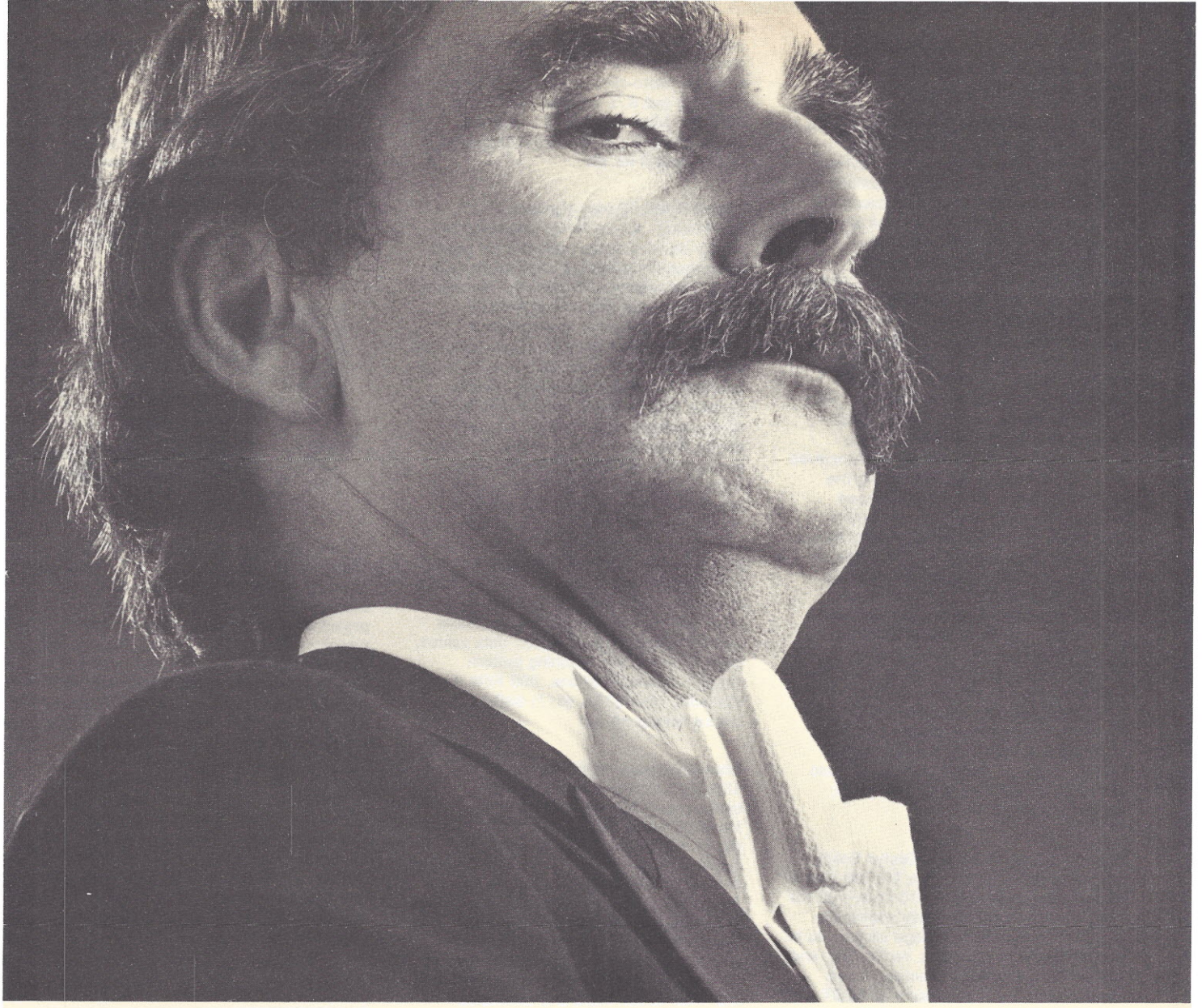
Adjustable CRT stand, Polyform Tilt/Swivel Ergonomic Platform, features variable two dial adjustment that optimizes the CRT-operator interface. Offered in 18-in. by 18-in. by 1.5-in. and 20-in. by 24-in. by 1.5-in. sizes, the platform

provides up to 18° bi-axial tilting to reduce glare, 360° swivel, 5-in. elevation, and a 250-lb capacity. Price: $175. Polyform Corp., 69 Milk St., Westboro, MA 01581, (617) 366-4161.
CIRCLE INQUIRY NO. 258

Metal print wheels are designed for compatibility with all Xerox and Diablo information processing printers. The metal print wheel spokes are stainless steel. These spokes are joined to the 88 characters, each of which is made of glass-reinforced phenolic. Once joined, the



characters are electroplated with nickel, a process which promotes crisp impressions and longer character life. Datamarc metal print wheels are currently available in three fonts: Titan 10, Elite 12 and Letter Gothic 12. Price: $37.50. Datamarc, 1251



A Case For Discrimination.

Discriminating computer users don't want the *best known* word processing software. They want the *best* word processing software.

Hewlett Packard, for instance, spent 9 months comparing 7 microcomputer word processing software systems—including the most popular brands—for distribution with the new HP125 microcomputer.

Hewlett Packard's conclusion: Spellbinder is superior to every other system evaluated.

The reason? Spellbinder's unrivalled ease-of-use and superior capabilities. Spellbinder requires fewer keystrokes for entering and editing text, and provides more flexible printing options without changing the way you enter text. Spellbinder and an inexpensive microcomputer easily rival dedicated word processing systems costing up to *three times* more.

In addition, Spellbinder offers features for mass mailing and for professional legal texts. The price also includes forms handling and "boiler plate" features to store and merge commonly used documents, forms, and paragraphs.

Best of all, Spellbinder's lofty capabilities are available at a very competitive price. In fact, some of the bigger names in word processing packages demand a much higher price, for a package with far fewer features.

Hewlett Packard wouldn't settle for less than Spellbinder. You should be just as discriminating. See your nearest computer dealer for a demonstration of Spellbinder. Or call Lexisoft at (916) 758-3630.

Spellbinder™

Spellbinder Word Processing and Office Management System.

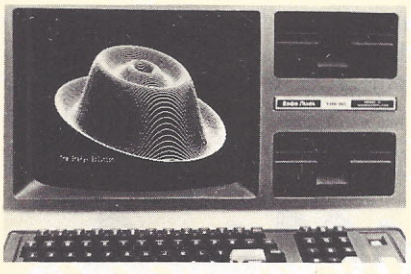
A product of Lexisoft, Inc.
Box 267, Davis, CA 95616 □ (916) 758-3630

CIRCLE INQUIRY NO. 53

Columbia, Richardson, TX 75081, (214) 783-1691.
CIRCLE INQUIRY NO. 259

5.25-in. flexible disk media are designed for use in high density data storage applications. UHR I floppy disk provides ultra high-density recording capabilities for 150-200 track per inch (tpi) applications. The companion VHR I floppy disk is designed for 96 tpi data storage applications. Both products are manufactured using a special spin coating technique, which is similar to that used for rigid disk media. The result is a more consistent dispersion of the magnetic coating. With UHR I, it allows a much thinner coating for linear recording densities as high as 10,000 bits per inch (bpi). One of the major benefits of spin coating is improved modulation—the magnetic particles tend to align themselves with the rotation of the disk during the coating process. This minimizes read failures due to bit shift and, in general, spin coating provides better consistency in signal handling capabilities. The surface resistance of the disks is reduced to a level of less than 50×10^6 ohms per square inch. The high conductivity of the disk coating tends to simulate that of an aluminum substrate, discharging static electricity by using the coating as its own conducting path. Improved surface resistance reduces the chance of static arcing between the read/write head and the media. Brown Disc Manufacturing, 1015 Garden of the Gods Rd., Colorado Springs, CO 80907, (303) 593-1015.
CIRCLE INQUIRY NO. 260

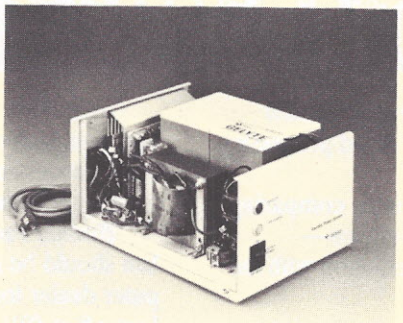
Add-on graphics board, Grafyx Solution, gives any configuration of a TRS-80 model III computer a resolution of 512-by-192 for a total of 98,304 individually accessible points. The graphics package allows you to set and reset points, lines, rectangles, and complement or clear the screen using simple Basic commands such as PLOT and LINE. Alternate resolutions of 256 by 192, 128 by 192, or 128 by 96 are also possible. An 80-character display for business forms and word processing is possible with the supplied Column80 program. In addition to a number of instructive demonstration programs, the board comes with software to save or load



a graphics screen and to send a hi-res screen to printer with graphics capabilities. When enabled, the hi-res graphics screen is displayed on top of the normal character display. The Grafyx Solution is an add-on circuit board, which contains 12,288 bytes of additional read/write memory that does not conflict with the TRS-80 address space. Upgrading requires no soldering consisting of clipping on some micro-clips, cutting one trace, and removing two IC's from sockets. Price: $299.95. Micro-Labs, 902 Pinecrest, Richardson, TX 75080, (214) 235-0915.
CIRCLE INQUIRY NO. 261

Stand-alone display system, Graphwriter, serves those who need to rapidly develop visual materials for board and executive meetings, staff gatherings and other sessions. It takes the numerical data of the user and converts it into illustrated displays of information. A Hewlett-Packard HP 80 microcomputer and an eight-pen plotter permit a non-technical operator high-quality business graphics. Graphic requirements can be specified for 40-standard formats. These include bar charts, line graphs, pie and tabular, Gantt and organization charts. Demographics, media schedules and market research are appropriate applications. The programs lock out all of the keys except those that can supply valid input at the current step of preparing a plot. A typical specification form allows the person making the request to specify a title of up to three lines, a three-line footnote, labels for the X-axis and the Y-axis, scaling factor, data values, legends, color and hatching pattern. Graphic Communications, 200 Fifth Ave., Waltham, MA 02254, (617) 890-8778.
CIRCLE INQUIRY NO. 262

Standby Power System, model SPS0200, provides 200 watts of emergency electrical power at 120 volts for 20 minutes, and takes over the job of power supply automatically within one cycle of power failure. One of the key uses is in business applications where a line power failure could cause irretrievable loss of data in memory and perhaps even irreversible damage to magnetic media should the power failure occur during disk access. The device contains a continuous line filter, which traps and eliminates dangerous spikes in current during normal usage. The system is plugged into a power



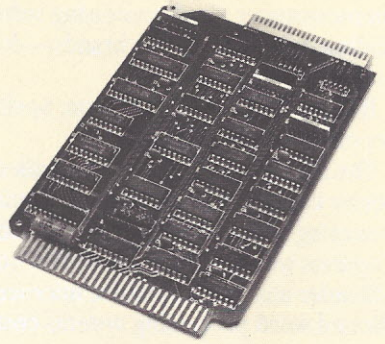
outlet and the computer devices, including mainframe, terminal and other peripherals, are plugged into it. As long as the power is constant into the SPS, the current passes through to the computer. However, if power drops below 102 volts, a sensing device immediately switches to output from its internal battery and a red indicator light warns the user of the switch. Since most small computers will not notice a power failure for approximately 3 cycles, the SPS inverter will be in action before the computer knows anything is amiss in the line power supply. Gould Portable Battery Div., Box 43140, St. Paul, MN 55164.
CIRCLE INQUIRY NO. 263

Portable, plug-in UPS system, Mini UPS, is designed to protect small electronic equipment from potential AC power line problems. It is available in 400 VA and 750 VA models (60 Hz), and also 300 VA and 600 VA (50 Hz) ratings. Intended for use with POS terminals, electronic lab monitors

and test devices, microcomputers, and other digital electronics, the unit contains a sealed, maintenance-free, lead-acid type battery. In a blackout situation, the unit provides up to 20 minutes of regulated power at full load from battery backup. An auxiliary battery pack supplies up to 60 minutes of additional regulated emergency power. It operates from a single-phase 115 VAC input and provides an output voltage regulated to ±3% of nominal through input fluctuations as great as +10 −20%. Input frequency fluctuations of up to ±10% of nominal (60 Hz) are tightly regulated at the output to ±0.5 Hz (one-half cycle). The unit also attenuates electrical noise and limits output harmonic distortion to less than 5% total RMS. Sola Electric, 1717 Busse Rd., Elk Grove Village, IL 60007, (312) 439-2800.
CIRCLE INQUIRY NO. 264

PERIPHERALS

Winchester controller interface can choose drive capacities from 5M bytes to over 20M bytes, with a choice of 5¼-in., 8-in. or 14-in. formats. It adapts STD BUS backplane signals to the standard disk controller/transfer protocol supported by Shugart Assoc., Data Technology Corp. and other manufacturers of intelligent



Winchester controllers. The I/O mapped interface includes hardware handshaking, and allows multiple SB8740s, residing in separate STD BUS systems, to share a

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Professional Systems Corp., 3858 Carson St., Suite 220, Torrance, CA 90503 (213) 316-5345

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The Physicians Office Computer software runs on most CP/M* systems with CBASIC2* and 56K RAM with a 132 column printer (hard disk recommended).

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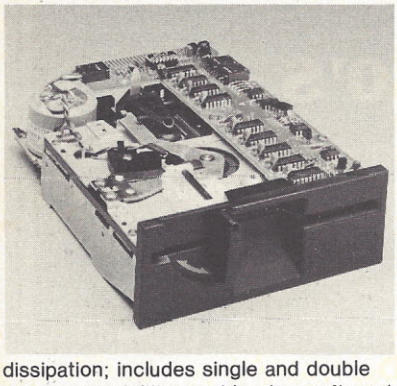
common set of drives and controller. The SB8740 can be operated in programmed I/O or interrupt driven modes for minimum cost systems. Price: $150. Micro/Sys, 1367 Foothill Blvd., La Canada, CA 91011, (213) 790-7267.

CIRCLE INQUIRY NO. 271

Diskette drive, model SA200, is a low-profile, low-cost mini-floppy disk drive to such application as personal computers, memory typewriters, word processors, terminals and printers. Features include: 2.05-in. high by 5.75-in. wide by 8-in. deep; weighs 3 pounds; has low heat



dissipation; includes single and double density capabilities and hard or soft sector capacities. Positive media insertion is included to keep door from closing on media. Shugart Associates, 475 Oakmead Parkway, Sunnyvale, CA 94086, (408) 733-0100.

CIRCLE INQUIRY NO. 272

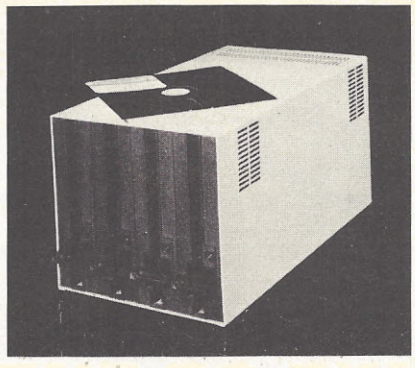
Parallel Switch Box, the GIS P-36, allows the sharing of popular parallel printers (Epson and Centronics) between two microcomputers. The primary application is in the sharing of an Epson or Centronics parallel printer and two IBM Personal Computers. The unit utilizes a printed circuit board, eliminating hand wiring, and comes with a 5-year warranty. Price: $149. General Interface Systems, 352 S. Hartz Ave., Danville, CA 94526, (415) 838-2683.

CIRCLE INQUIRY NO. 273

Add-in Winchester disk system requires no external chassis and can be installed directly in the floppy disk area of the IBM computer. The system offers storage capacities of 6, 12, or 18M bytes per drive. The system's single-board Winchester disk controller supports up to four Winchester drives and is buffered with automatic error correction. The system includes software, controller, disk drive, and documentation. Price: $2,995. for the 6M-byte version, $3,495. for the 12M-byte version, and $4,195. for the 18M-byte version. Datamac Computer Systems, 680 Almanor Ave., Sunnyvale, CA 94086, (408) 735-0323.

CIRCLE INQUIRY NO. 274

8-in. disk drive subsystem, CMS 1600-4, utilizes four Tandon Thinline DS/DD 8-in. drives. These drives are only one-half the thickness of standard drives, so the entire unit occupies the same space as a standard two-drive cabinet. Storage capacity is 4.8M bytes, suitable for many business and word processing applications. The subsystem includes power supply, cables and choice of metal or wood trim cabinets, and utilizes the standard Shugart-compatible interface for 8-in. CP/M disks.



Price: $2,995. Columbia Microsystems, 905 E. Broadway, Columbia, MO 65201, (314) 875-8900.

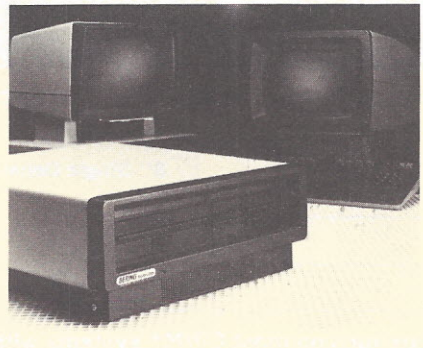
CIRCLE INQUIRY NO. 275

XCOMP Winchester hard disk subsystem, Personal Hard Disk, is for the IBM Personal Computer. It has a capacity of 5M bytes or 10M bytes. It is packaged in a table top enclosure of 14.5-in. L by 8.55W by 4.5H. The enclosure contains the Winchester drive, XCOMP ST/R controller, power supply, and a four foot ribbon cable to the IBM computer chassis.

The AC power on the enclosure is selectable from 110VAC to 220VAC for 50/60Hz. Support software including I/O drivers and diagnostics is provided on 5.25-in. diskettes. Price: $3,495. for the 5M-byte subsystem, and $3,995. for the 10M-byte subsystem. XCOMP, 7566 Trade St., San Diego, CA 92121, (714) 271-8730.

CIRCLE INQUIRY NO. 276

Double-density floppy disk subsystem, Bering 2895, is hardware-, software-, and media-compatible with the Hewlett-Packard 9895A. It connects to the HP-IB (GPIB),



adding 2.36M bytes of immediate storage capacity to most HP mini, desktop and personal computers, including the HP 3000, 1000, 9800 series, HP 125, and 85/83. This storage capacity may be expanded to 4.72M bytes with the addition of a dual-drive slave unit. The 2895 is transparent to all HP operating systems and application software supporting the HP 9895A. In addition to reading and writing all HP double-density formats, the 2895 reads and writes the full range of IBM single- and double-density flexible disk formats. This facilitates the exchange of data and programs with other mini and microcomputer systems. Other features include an 8085/2900 microprocessor-based controller, automatic power down, built-in diagnostics, and the ability to format and duplicate diskettes independently of the host computer. Price: $4,660. Bering Industries, 747 East Brokaw Rd., San Jose, CA 95112, (408) 298-8552.

CIRCLE INQUIRY NO. 277

RS-232 minifloppy storage device, MiniMate III, provides up to 408K bytes of storage on a single-sided diskette. Operation is code switchable 7-bit ASCII or 8-bit binary. Binary operation provides for storing 8 bit program codes for microprocessors and machine tool applications, allowing punched paper tape units to be replaced with 5¼-in. diskettes. In addition, the MiniMate III includes File

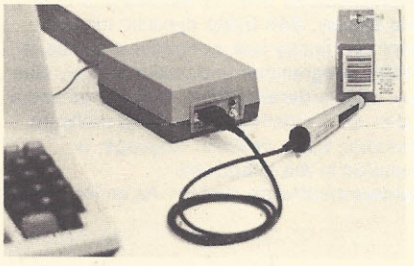
Management System, and automatic and manual controls for stand alone applications. Other features include: Dual RS-232 ports for easy insertion between terminal and modem; dual baud rates and answerback message; X-on, X-off code response; power up restart in case of AC power failure. Western Telematic, 2435 S. Anne St., Santa Ana, CA 92704, (714) 979-0363.

CIRCLE INQUIRY NO. 278

Dot matrix printer, Pro-Writer, is the newest member of the C.ITOH family, includes 120 cps bidirectional printing, logic seeking and proportional spacing. Graphics capability is built-in and includes shape and high resolution features. It has a 1K-byte buffer in parallel and 3K-byte buffer in serial, increment printing ability, N by 9 dot matrix, and its correspondence by 9 dot matrix, and its correspondence quality print in eight character sizes. It has a built-in tractor feed and will accept single-sheet feed. Paper cut-off is less than one inch from the print line. Manual functions include select, line feed, top of form and power-on, combined with paper empty and cover open switches. Pro-Writer is available in either parallel or serial (RS-232-C) interface. The serial version actually includes both the parallel and serial interfaces. The model also includes

X-On and X-Off features. Prices: parallel model, $795, serial version, $845. Leading Edge Products, 225 Turnpike St., Canton, MA 02021, (800) 343-6833.
CIRCLE INQUIRY NO. 279

Bar code reader/decoder, CYC-48, can be plugged between a computer and a terminal, or alone on an RS-232 cable at 9600, 4800, 1200, or 300 baud. By a pass of the wand, existing programs can now receive data as if from a keyboard. The bar code is verified, decoded and sent to the computer as ASCII characters. The optional voice output can be used to verbalize both the scanned data and



replies from the computer. The CYC-48 can also be configured to read most bar code formats including Code 39, UPC, Paperbytes. Current applications of bar code technology include manufacturing parts tracking, inventory control and library systems. Price: $650. New Wave Systems, 12123 Washington Pl., Mar Vista, CA 90066, (213) 475-8545.
CIRCLE INQUIRY NO. 280

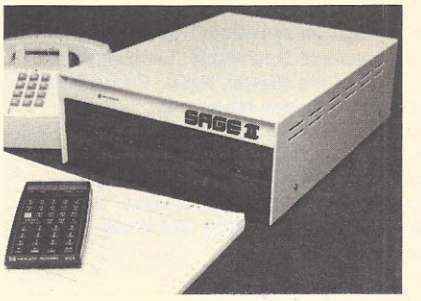
SYSTEMS

Personal computer, Franklin Ace 100, is hardware and software compatible with the Apple II. It has 64K bytes of RAM. It has a full upper and lower-case keyboard and character generator. The keyboard includes a twelve-key numeric pad, an alpha shift lock key and special keys with Visicalc designations. All programs written for the Apple II will run without

modification, including those using high and low resolution black and white graphics. All peripherals designed for the Apple II will operate with the Ace 100. A fully-compatible 5¼-in. disk drive is also available. Price: $1,595. Franklin Computer Corp., 7030 Colonial Highway, Pennsauken, NJ 08109, (609) 488-1700.
CIRCLE INQUIRY NO. 293

Hard disk systems, Eagle IV and V, combine hard disk memory in a single enclosure with the CPU, 12-in. CRT screen, floppy disk drive, keyboard and numeric keypad. The Eagle IV offers 7.5M bytes of integral formatted storage on a hard disk and the Eagle V provides 15M bytes of formatted hard disk storage. The computer systems include Spellbinder word processing software and the Accounting Plus package, at $8,995. for the Eagle IV and $9,995. for the Eagle V. Eagle Computer, 501A Vandell Way, Campbell, CA 95008.
CIRCLE INQUIRY NO. 294

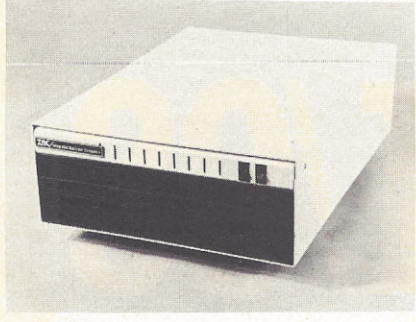
68000-based single board system, Sage II, contains between 128 and 512K bytes of parity RAM memory and up to 1.3M bytes of 5¼-in. floppy disk storage. It is able to execute two million register-to-



register additions per second and requires just over ½-cubic ft. of space. For

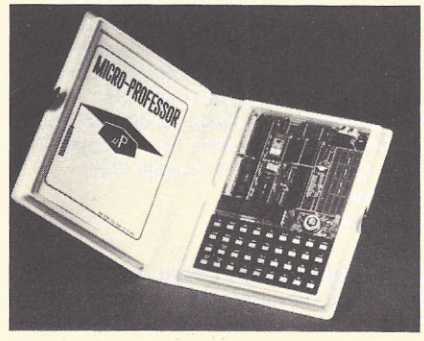
communications, the system contains two RS-232C serial ports, one Centronics-compatible parallel port and an IEEE-488 interface. An interrupt-driven version of the UCSD operation system from Softech Microsystems is available. Languages supported are Pascal, Basic, Fortran and assembler. Prices range from $3,600.-$6,000., depending upon disk and RAM configuration. The UCSD operating system is $400. extra. Sage Computer Technology, 195 N. Edison Way, Suite 14, Reno, NV 89502, (702) 322-6868.
CIRCLE INQUIRY NO. 295

6MHz computer system, Super Cadet, uses a Zilog Z80B 6MHz CPU and 150 NS RAM memory. It features 64K RAM chips, allowing 256K bytes of memory in a small 4-in. by 4-in. matrix. The memory power consumption and component count are reduced to increase reliability. Super Cadet memory can bank switch within any 4K block and the bank sizes can be varied at the flick of a switch. The system utilizes



single board construction, but can be expanded to include 10 I/O ports (9 ports for users and one for a printer), large SMD disk drives, and reel-to-reel or cartridge tape. It is completely vectored interrupt driven. All serial ports and disk controllers have interrupts available. The system uses an intelligent disk buffer rather than a DMA interface. This disk buffer allows CPU processing during disk operations. DMA circuitry requires that the CPU be inactive during disk I/O. Furthermore, the Zilog DMA chip will not handle the high-speed data I/O from the SMD disk. The SMD hard disk controller supports larger disk drives. The system is available in either a desk top or rack mounted unit. Price: $5,595. IBC/Integrated Business Computers, 21592 Marilla St., Chatsworth, CA 91311, (213) 882-9007.
CIRCLE INQUIRY NO. 296

Z80-based educational tool, Micro-Professor, is a single-board microcomputer packaged in a book-size case. It has 2K bytes of RAM, expandable to 4K, and 2K bytes of ROM. ROM is expandable to 8K. It is compatible with Z-80, 8080 and 8085 machine code, allowing the user to prototype, breadboard and design custom hardware and software applications. It has a built-in 6-digit, 0.5-in. LED display and a 36-key keyboard with 19 function keys, 16 hex-digit keys and 1 user-defined key. A 3.5 by 1.3-in. wire-wrap area is provided for user breadboarding, and cable connectors allow expansion of both the CPU and I/O bus. The board also has a built-in speaker and cassette tape interface. The kit includes a self-teaching manual with hardware descriptions, schematics, programming examples and user experiments. A 9V, 500mA power supply adapter is included to connect the

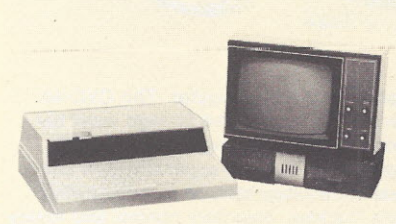


system directly to 120V AC outlets. Price: $149. Multitech Electronics, 195 W. El Camino Real, Sunnyvale, CA 94086, (408) 773-8400.
CIRCLE INQUIRY NO. 297

Self-programming system, Dimension One, is driven by a single, all-purpose, multi-application program that resides in 32K bytes of main memory. The program is made up of a group of pre-coded assembly language functions that will execute virtually every known business application. The user does not have to translate codes or symbols because the system communicates in non-technical terms. The system features a built-in user's prompting technique. To execute a function, a user fills out a series of specially-designed input specification forms. Sixteen forms encompass the entire range of Dimension One capabilities, but generally only five to ten forms are required for any application. The specifications from these forms are then entered into the system using a video display terminal and are stored as a "link table" in a designated terminal work area or partition on disk. This link table is actually generated by a special PRO algorithm that selects and links all the necessary routines from the library in the proper sequence. Since the multi-application program instructions are in assembly language and are used directly, no assemblies, compiles or interpretative routines are needed. The system can accommodate up to 32 terminals with up to 1M byte of main memory and 300M bytes of disk storage. A Data Streamer is incorporated for file backup. Optional printers include 150 1pm, 300 1pm, and 600 1pm. Capro, 12781 Pala Dr., Garden Grove, CA 92641.
CIRCLE INQUIRY NO. 298

Small business computers, models 310 and 710, have been added to the MAI product line. The Basic Four system 310, in its minimum configuration, consists of 96K bytes memory, 40M bytes fixed Winchester disk storage, one 150 LPM printer, one 1600bpi magnetic tape drive and two video display terminals. The maximum configuration offers 256K bytes memory, 120M-byte disk capacity, two 600 LPM printers, 16 VDTs and up to four multifunctional display terminals (MDTs) for word processing. The 710 replaces both the 610 and the 730 models. In its minimum configuration, the new model consists of 96K bytes memory, two 35M-byte removable disk drives, one VDT and a 300 LPM printer. The maximum configuration features 512K bytes memory, 600M bytes disk capacity, 32 VDTs, four MDTs and two parallel printers. Prices: system 310, $55,900. 710, $69,100. MAI Basic Four Information Systems Div., Box C-11921, Santa Ana, CA 92711, (714) 731-5100.
CIRCLE INQUIRY NO. 299

System for industrial applications, DIS-1, also functions as a development system, with floppy disks, CRT monitor, wide expansion options, software and multi-languages. It combines in one enclosure a 6502-based Aim 65 microcomputer with full keyboard, printer and display, 64K bytes dynamic memory, CRT and floppy disk controller modules, a PROM programmer and power supply, plus two double-density floppy disk drives and a 12-in. CRT monitor. All required software, including Basic or Forth language, is included in the integrated hardware/software system. As an industrial



microcomputer system, the unit can be customized for specific applications with any of hundreds of off-the-shelf modules available from many manufacturers. Other expansion modules, such as IEEE-488 controller, ACIA for RS-232 applications, solid-state relay modules, clock and calendar, CMOS memory with battery back-up, are available. DIS-1 systems can be configured to accept up to ten additional modules (six Eurocard and four Exorciser size). Final custom configurations are available from the company or can be designed by the user. Available languages include Forth, Basic, Assembler and PL/65. The DIS-1 enclosure will also allow use of Rockwell's Aim 65/40 microcomputer in place of the Aim 65. Price: $4,950. Dynatem Inc., 20881 Paseo Olma, El Toro, CA 92630.
CIRCLE INQUIRY NO. 300

TERMINALS

Video display terminal, AJ 520, is designed for user comfort in the timesharing and in-house shared computer market. It can be used for such applications as financial analysis, inventory control, personnel records, data entry and inquiry and retrieval. The terminal features a detached typewriter-style keyboard with contoured keytops and adjustable audible "click". There is a separate 17-key numeric keypad for rapid touch entry of figures. The N-key rollover feature lets

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operators enter data rapidly without fear of locking the keyboard or jamming entries. The full 15-in. non-glare screen allows extra large character display—even in 132-column mode, the displayed characters are up to 50% larger than those of most 80-column displays. Brightness/contrast controls, screen tilt adjustment, and six video attributes make even complicated text easy to read. There are 12

programmable function keys for performing multi-step operations such as sign-on/off, system status, display directory or other frequently used programs. Programming is simple, and may be accomplished by the user from the keyboard or from the host computer. The unit includes 5K bytes of RAM memory. Anderson Jacobson, 521 Charcot Ave., San Jose, CA 95131, (408) 286-7960, ext. 2602.
CIRCLE INQUIRY NO. 304

Editing display terminal, the Tab 132/15, features a 15-in., non-glare, high resolution screen, 132-column format, 7 by 11 dot matrix characters in a 9 × 14 cell, screen-labeled soft keys and English language prompts for set up and operation modes. The unit is designed specifically for the operator. English (or other)

language prompts lead him through set up and operation modes. There is no need to learn computer terminology or to refer to detailed manual instructions. Price: $2,100. Tab Products, 1451 California Ave., Palo Alto, CA 94304, (415) 858-2500.
CIRCLE INQUIRY NO. 305

Portable data entry terminal, Alpha-Tone, with alpha-numeric capability and memory transmits Touch-Tone signals. The Alpha-Tone features 44 keys and 100 characters of storage capacity, user programmable for data, telephone numbers, product codes, etc. Stored data may be recalled and transmitted as needed. Typical applications include remote data and order entry. The unit is powered by a 9-volt battery, couples acoustically to a standard telephone

handset and is compatible with all Touch-Tone activated, tone, and voice response systems. Price: $225. Interface Technology, 10500 Kahlmeyer Dr., St. Louis, MO 63132, (314) 426-6880.
CIRCLE INQUIRY NO. 306

Color Display Station, Telex 279, is a four-color, plug-compatible replacement to IBM's 3279/2A keyboard display. Unlike other 3270 color displays, the 279 requires no controller or system changes for displaying alphanumeric data with colored fields. The unit offers many performance characteristics of the 278 plug-compatible keyboard display station. Key features are an easy-to-read non-glare, smear-resistant screen; moveable keyboards with convenient single key clear and program function keys; and optional display performance features, which include

a row and column indicator, keystroke counter, and response time indicator. The color 279 display will intermix with monochromatic Telex 278 displays or IBM 3278 displays in the same cluster. The 279 cabinet is identical to the 278 cabinet. An operator-selectable switch enables the display to be operated in a two-color mode as a Telex 278 or IBM 3278 equivalent. Fields in this mode are displayed in green for normal intensity and white for high intensity. Price: $3,500. Telex, 6422 E. 41st St., Tulsa, OK 74135, (918) 627-1111.
CIRCLE INQUIRY NO. 307

Graphics boards, SG101 and SG201, are designed specifically to enhance C. Itoh Electronics CIT-101 with full-feature interactive graphics capabilities. Both boards provide 1225-by-240 dot resolution on the CRT. The CIT-101 is a versatile, multifunction display terminal that can be interfaced with a variety of computer systems and is directly interchangeable with Digital Equipment Corporation's VT100 terminal. The graphics boards allow the terminal to retain all of its original capabilities without alteration, while new commands are added to provide graphics

capabilities. Both models can be field-installed into the terminal in five to ten minutes, simply by mounting the board in the existing card cage of the terminal and connecting three cables. Both models are priced in the $1,500 range. Selanar Corp., 437-A Aldo Ave., Santa Clara, CA 95050, (408) 727-2811.
CIRCLE INQUIRY NO. 308

Multiport communications terminal, model 7700, is designed to concurrently prepare, transmit and receive messages via TWX, TLX, DDD and PTL protocols. The unit's features allow it to replace multiple existing terminals, reduce the effort of message preparation, simplify the process of message transmission and reception, and report on the status of communication activity. The unit includes an operator-friendly message editor, which incorporates a complete set of text manipulation facilities, reducing the time and effort involved in message preparation. The message editor includes such automatic features as word wrap, paragraph formatting, screen scroll, text insertion/deletion and search forward/

backward. Dialing, answerback verification, and transmission are automatically performed in the background, while new messages are prepared on the CRT screen. The CRT screen displays characters in a 7-by-9 dot matrix, using a 25 line-by-64 column format. The unit is configured with up to 80K bytes of memory and an integrated diskette is provided for additional message storage. Also included with the basic unit is a dot matrix impact printer with a 30 cps minimum print speed. The unit, when configured with a TWX port and a TLX port, is priced at $7,550. Carterfone Communications Corp., 1111 West

Are your operators making computer errors with their feet?

As they walk and move about, your operators build up a static charge.

Just by taking a couple steps across the floor in a well air-conditioned room, they can generate 5,000 volts or more.

Or, in the wintertime, 10,000 volts or more.

Static can also be generated just by sitting down in a chair.

And if the operator's next move is to touch one of your terminals, the result can be a blank screen, erratic data, spewing paper, or an altered memory.

Another result can be annoyed customers.

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But, for less than the cost of a single service call, you can effectively control static at every terminal, every word processor and microprocessor-based unit.

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3M Static Control Floor Mats and Runners create inexpensive islands and pathways of protection around and between sensitive areas. Static charges drain harmlessly from operators and other personnel as they walk, stand or sit.

Available in a choice of colors, and in many sizes, 3M Static Control Mats are carefully engineered for performance, comfort, durability, ease of cleaning and safety. For standing and sitting applications.

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Mockingbird Ln., Suite 1400, Dallas, TX 75247, (214) 630-9700.
CIRCLE INQUIRY NO. 309

Programmer Workstation, Programate 1000, provides cost-effective preparation and updating of documentation for computer programs and systems. By combining interactive graphic and text processing, the workstation permits the single keystroke entry and editing of all the symbols typically used to prepare documentation, such as system structure charts and flow diagrams. The system is intended primarily as a standalone documentation station, but it can also be an intelligent terminal connected to a host computer for editing downloaded source code. In the latter mode, system maintenance and documentation maintenance can both be accomplished at the same sitting. The complete turnkey system, including 15-in., 132-column by 40-line graphic display, dual 8-in. floppy disk drive, 124-button keyboard, high

speed printer for both high quality graphics and text, and software, is priced under $20,000. GWP Corp., 196 Broadway, Cambridge, MA 02139, (617) 864-7710.
CIRCLE INQUIRY NO. 310

Computer terminal, model D314, is IBM 3275-2-compatible. In addition to IBM's standard features, the compact unit includes a 25th status line, interface capability with low cost serial printers, and daisy chain interface, which permits several terminals to be connected in multi-drop for communications cost savings. The unit also has the capability of functioning as an IBM 3271 with one 3277 display and keyboard. The terminal supports standard 3270 screen attributes and its standard printer port functions exactly as IBM's. The terminal features a full typewriter keyboard, separate numeric keypad, program function keys and cursor control pad. Informer, Inc., Box 91054, Los Angeles, CA 90009, (213) 649-2030.
CIRCLE INQUIRY NO. 311

Portable terminal, Infone, can send and receive data from timesharing computers or personal computers with Bell-103 compatible modems. Each unit has an LSI modem, allowing direct connection to the dial-up network for data calls. Files can be created and stored, then transmitted at a preprogrammed time to reduce communication costs. It can automatically "wake up" to answer a call, record data, and text and store it for later use. Peripherals that can be attached to the unit include: a standard tape cassette recorder, a 40-column thermal printer, an external speaker, and a folding acoustic modem adapter for pay phones in situations where a modular telephone jack is not available. Price: $1,150. Novation, 18664 Oxnard St., Tarzana, CA 91356, (213) 996-5060.
CIRCLE INQUIRY NO. 312

SOFTWARE

BUSINESS

Mailing system, Postscript, is designed to run under the CP/M and MP/M operating systems. It is written in CBasic II and will run on any CP/M or MP/M environment with 48K bytes of RAM and sufficient auxiliary storage to maintain the mailing lists. It is designed as an all-purpose system for the support of general mailing needs. It has several unique features that allow the user options not available on many other mailing systems. It can do both envelopes and labels, selects on nine fields and sorts on six, and uses a customer ID code compatible with most existing client codes. In addition, it interfaces with Wordstar and Magic Wand word processing systems and is designed to be easily modified to interface with popular accounting packages. Price: $245. JBA, Inc. is the primary distributor for the product's manufacturer, Falcon Software Systems. JBA, 23101 Moulton Dr., Suite 208, Laguna Hills, CA 92653, (714) 855-0135.
CIRCLE INQUIRY NO. 318

Personal banking system, the Money Maestro, runs under the CP/M operating system supplied with each Osborne 1 computer. Money Maestro has built the facilities for Electronic Funds Transfer (EFT) and awaits the implementation from the banks to allow personal computers to perform most banking functions via the telephone network. The system comes with a modifiable built-in category list. Errors are corrected by first prompting the user with possible correct responses, followed by extensive help messages. Money Maestro enables financial record keeping, reporting and management. Based on straightforward cash accounting, this system will generate and print checks and keep the checkregister, as well as recording transactions made in cash or by charge card. As payments are made and deposits recorded, they may be assigned to pre-specified categories of expense and income. Each category may have associated with it a budgetary amount for each month, and the system will provide gentle reminders at the time of paying a bill that puts the user over budget. Extensive comparisons of budget to actual amounts for the month-to-date and year-to-date. A stockpiling feature provides storage of recurring transactions such as loan and insurance payments. A review of these stockpiled transactions may be made prior to payment and partial payments are easily handled. Silverman Asociates, 2405 4th St., Berkely, CA 94710, (415) 644-2954.
CIRCLE INQUIRY NO. 319

Dictionary Software, Microproof, is available on five CP/M formats: Osborne, Apple, Superbrain, Omkron, and standard IBM 8-in. formatted disks. Microproof checks word processed documents for spelling errors using a 50,000 word dictionary. The dictionary occupies only a third of a double density 5-in. disk; additional words can be added. An optional correction feature is available allowing corrections to be made within the text without returning to the word processing program. Price: $149 (also available for TRS-80 and Apple II at $69.50). Optional correction feature: $60. Cornucopia Software, 1625 Beverly Pl., Berkely, CA 94707.
CIRCLE INQUIRY NO. 320

Spelling correction program, Spellmaster, allows context editing without exiting the program. It examines any text file and compares each word to a comprehensive set of spelling dictionaries. When locating a spelling not in one of the dictionaries, the program displays the questionable word, its context, and an educated guess as to proper spelling. The user may then accept the original spelling, use the guess, edit the word and/or context, or request the program to make another guess. The program's disk-resident master dictionary contains over 100,000 words. All words are checked against the dictionary—including possessive forms. A hyphen at the end of a line is also distinguished from one in the middle of a hyphenated word and handled accordingly. Each word is checked in the sequence in which it appears in the source document. Spellmaster keeps a 15,000-word subset of the master dictionary in the computer's RAM memory. This internal dictionary contains the most commonly used English words. Words unique to the user's profession can also be added to the internal dictionary. All commands are single keystrokes selected from a one-line menu displayed across the top of the terminal's screen. The overall set of menus is organized in a tree structure such that a new menu is displayed in response to each command. The Spellmaster package is available on 5-in. diskette (model SPMR-S) or 8-in. diskette (model SPMR-L). Price: $295. Cromemco, 280 Bernardo Ave., Mountain View, CA 94043, (415) 964-7400.
CIRCLE INQUIRY NO. 321

Hardisk accounting series is written in USCD Pascal. The program can run on Apple II and III, with a Corvus or Profile hardisk, on IBM's Personal Computers and most other microcomputers. The menu-driven, double entry accounting system features interactive modules, complete audit trails, extensive data prompts and error checking. Great Plains Software, 123 N. 15th St., Fargo, ND 58102, (701) 293-8483.
CIRCLE INQUIRY NO. 322

Income tax planning program, Shortax, computes income and social security taxes of individuals, trusts or corporations for six tax years. It can determine regular income tax, tax using income averaging, 50% maximum tax on earned income, add-on minimum tax and alternative minimum tax.

Now What?

Don't be caught with a critical job to be run and a key file unavailable because of a damaged disk. **DPATCH** recovers data from damaged hard or floppy disks, and flags I/O errors without destroying user data. **DPATCH** also recovers files accidentally erased, displays (and alters) any sector on a disk, and can provide a printed log of each session. Designed with the business computer user in mind, **DPATCH** operates in full screen mode on any CP/M™or MP/M™system, and is supplied with a comprehensive set of documentation. **DPATCH** is backed by AMT, a leading software company servicing the needs of Silicon Valley. **DPATCH** retails for $195.00 per copy; multi copy discounts are available. Visa or MasterCard are accepted for payment. OEM enquiries are welcomed.

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CIRCLE INQUIRY NO. 3

The program is designed for financial advisors and taxpayers who are familiar with the tax rules but not with the operation of a computer. Shortax is written for the CP/M disk operating system. It is delivered in compiled form on 8-in. single density disks without the operating system. Programs are also available for the 5¼-in. Apple II disk systems using the Z80 softcard and on a variety of other systems using 5¼-in. diskettes. The program requires a minimum of 48,000 characters of central processor memory and at least one disk drive with 90,000 characters of memory. Shortax is not a tax preparation program. It is for year-round use to estimate the tax impact of alternative business and investment decisions such as: the year by year tax impact of a tax shelter; the tax feasibility of forming a corporation; the tax savings available with trusts for the childrens' future college expenses, and the tax impact of selling investments at different times. It can also be used to compute a taxpayers' estimated taxes on a quarterly basis or to determine optimum salary for the owner of a closely held corporation. Price: $500. Syntax Corp., Box 8137, 4500 W. 72nd Terrace, Prairie Village, KS 66208.
CIRCLE INQUIRY NO. 323

Interactive business system, Busicomp, is designed to handle the accounting needs of small businesses. It can be used on the Apple or Apple II + systems with 48K bytes and at least one disk drive. Six levels of security guard up to 11 program sections encompassing most accounting functions. All sections are interactive,

allowing single-step entry. Busicomp incorporates an error-trapping, menu-driven, self prompting design. Among the 41 reports generated are aging and data on receivables and payables, personnel, payroll, inventory, expenses, revenue and journal posting. Formats correspond to standard DSF Forms. Price: $1,500. Advanced Operating Systems, 450 St. John Rd., Michigan City, IN 46360, (219) 879-4693.
CIRCLE INQUIRY NO. 324

Text-processor Versatext, is written especially for the IBM Personal Computer and the IBM or Epson printer. Versatext features text justification, underlining, titles, paging and paragraphing. In addition, special features of the printers such as printing wide, compressed and special characters are easily handled by embedding Versatext commands within the text. With Versatext, you may prompt for runtime entry, which makes it possible to write one letter, and have it addressed to any number of people. Texasoft, 1028 North Madison Ave., Dallas, Tx 75208, (214) 495-5052.
CIRCLE INQUIRY NO. 325

Business software, Executive Accounting System, is compatible with the IBM Personal Computer. The package is designed to meet the accounting needs of business executives, bookkeepers, accountants and others. It is entirely menu-driven. The package has a quick reference card and a user-friendly manual with step-by-step instructions. It ends redundant writing and calculations, warns of mistakes and lets you review transactions on the screen or in a printed report. It automatically posts transactions, sorts accounts, closes periods, and gives quick access to current data. The package is integrated with general ledger, accounts receivable and accounts payable modules. It includes a user's manual, program diskettes and will have add-on modules for inventory, letter writing, budgeting, graphic analysis and payroll. Denver Software, 14100 E. Jewell Ave., Suite 15, Aurora, CO 80012, (303) 750-9980.
CIRCLE INQUIRY NO. 326

Numeric analysis package, Planmaster, provides automatic spread-sheet analysis for hundreds of applications including financial planning, cost accounting, sales forecasting, production planning, cash flow analysis and scientific data analysis. The user can modify the format to meet the requirements of any project. The program automatically recalculates all appropriate totals with each new entry. It can produce a ledger and balance sheet, a chart, a bank statement, an expense account record or any variety of formats the user designs for specific business, engineering and scientific applications. A key feature is the Plansheet. A single Plansheet can include 10 or more separate pages, over 1,000 lines, or up to 130 columns, allowing the program to accommodate large projects. The program is available on 5-in. floppy diskette (model PLMR-S) or 8-in. floppy diskette (model PLMR-L). Price: $295. Cromemco, 280 Bernardo Ave., Mountain View, CA 94043, (415) 964-7400.
CIRCLE INQUIRY NO. 327

Data management system, Symbolic Dynamic Access Method, Version II (SDAM/II), is designed to give the microcomputer professional the capabilities of mainframe data management systems. It features object coded programs that can create SDAM/II data bases and schema, load records interactively from any terminal, update on-line and inquire with single or multiple parameters, produce custom tabular reports with the SAVE option to recall frequently-used formats, and compress SDAM/II data bases for efficiency and space. A subroutine package written in Microsoft Basic 80 (Rel. 5.0) interfaces with application packages. The program is now available on 8-in. and most 5¼-in., single density floppy diskettes in CP/M format with comprehensive documentation. For systems with a minimum of 48K bytes memory. Price: $149. Computer Development Specialists of Long Island, Suite 23, 90 Broadhollow Rd., Melville, NY 11747, (516) 732-2407.
CIRCLE INQUIRY NO. 328

Small business package, Mailpack, combines the features of Kwikrite, a simplified letter and text writing set of programs, Docurite, a multi-page, comprehensive word processor, Customer, a specialized data base manager and a new interfacing program, Mailsome. This allows the user to create a customer data base, draw from the data base a sub-set of customers of clients, generate a letter or document to be sent to that sub-set of customer with the inside address and salutation customized for each client in that particular sub-list. The total package is available for TRS-80 models I or III. A minimum of 32K bytes and two disk drives are required. Customer records may be keyed by any six character code, and the access to the data base manager is direct. The operation of the Mailpack software is fully interactive, with a master menu and sub-menus for every module. Any of the modules may be purchased and used separately, so that a user can purchase the total package in stages. Price: $149.95. Simplified Software Systems, 118 Third Ave. N.W., Box 1192, Hickory, NC 28601.
CIRCLE INQUIRY NO. 329

Law office management system for the Archives Computer consists of three main elements. The first is a legal time and billing package, The Firm Solution. The package features automatic time and expense entry, comprehensive pre-billing worksheet, calendar and docket control plus detailed management reports of the firm's activities. The second element is its Wordstar word processing capabilities. The Archives microcomputer uses twenty special function keys to eliminate key strokes. The third element is access to the legal research database Westlaw. Archives, 404 West 35th St., Davenport, IO, (319) 386-7401.
CIRCLE INQUIRY NO. 330

Property management system for tracking income and expenses on rental property handles a mixture of property rentals including single family homes and condominiums. Information for each rental is kept on-line including up to three renter names or name-and-address, four phone numbers, date rented, rent amount, deposits, number of returned checks plus two memo lines. This information, along with rental income tracking data, is stored on diskette and is displayed on-screen at any time for information or updating purposes. All information can be printed for a permanent record. The system is available for the Radio Shack models I and III and the Apple II and III. Price: $375. Realty Software Co., 1116 F 8th St., Manhattan Beach, CA 90266, (213) 372-9419.
CIRCLE INQUIRY NO. 331

Programmable controller management package, the Programmable Controller Report Generator, allows the user to prepare machine-produced reports on the status and activity of up to 64 PCs being monitored. In operation, the user formats

Can you improve excellence? We can.

By adding our Memotech Memopak to the excellence of the ZX81, we have achieved perfection.

The growth of interest in computer use caused by the introduction of the Sinclair ZX81 has made new and exciting demands on the ingenuity of electronic engineers. At Memotech we have focused our attention on the design of inexpensive, reliable memory extensions.

The Memopak is a 64K RAM pack which extends the memory of the ZX81 by a further 56K. The new memory extensions are designed to be within the price range expected by Sinclair users. It plugs directly into the back of the ZX81 and does not inhibit the use of the printer or other add-on boards. There is no need for an additional power supply or leads.

Increase your memory.
The Memopak together with the ZX81 gives a full 64K, which is neither switched nor paged, and is directly addressable. The unit is user transparent and accepts such basic commands as 10 DIM A(9000).

0-8K . . . Sinclair ZX81 ROM
8-16K . . . This section of memory switches in or out in 4K blocks to leave space for memory mapping, holds its contents during cassette loads, allows communication between programs, and can be used to run assembly language routines.
16-32K . . . This area can be used for basic programs and assembly language routines.
32-64K . . . 32K of RAM memory for basic variables and large arrays.

With the Memopak extension the ZX81 is transformed into a powerful computer, suitable for business, leisure and educational use, at a fraction of the cost of comparable systems.

Free service on your Memopak.
Within the first 90 days, should anything go wrong with your Memopak return it to us and we will fix or replace it free of charge.

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You can use our Memopak in your home without obligation. After 10 days, if you are not completely satisfied, simply return it for a full refund.

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Memopak 64k RAM	$ 179.95		
Memopak 16k RAM	$ 79.95		
Shipping and Handling	$ 4.95	———	$ 4.95
		Total	

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Act. No. _____

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Name _____
Street _____
City _____ State _____ Zip _____

† U.S. Dollars

the reports once, identifies data that is to be retrieved from the PCs, and then periodically runs the report. The PCs are connected, usually through a communications network such as the PC manufacturer's own data highway or direct RS-232 interfaces. Reports produced from PCs installed in discrete manufacturing facilities typically show production counts per shift, machine up/down times, machine

status, etc., and can automatically include current PC data. For PCs used in continuous processing facilities, flow, temperature, pressures, production, etc., may all be tracked and stored for later trending. Report pages can be up to 66 lines deep and 132 columns wide. PC data can be displayed in several different formats and can be shown with data obtained from the operator as well as fixed information. Report copies are available via printer, CRT screen, or disk file. Xycom, 750 N. Maple Rd., Saline, MI 48176.
CIRCLE INQUIRY NO. 332

Manufacturing software package is for use on Mercator Business Systems. The package is designed for the small-to-medium size company grossing between $5 million and $100 million a year. The system allows the user to coordinate and control the vital functions of stock room, work-in-progress, finished goods inventory, job and product cost accounting, labor distribution, purchasing, and product structure maintenance. The package runs under Mercator's Business Basic operating system on the sixteen-user model 5000, eight-user model 4000, and four-user model 3000. Each system incorporates 16-bit architecture, and uses Winchester disk and tape cartridge backup. Hard disk storage can be expanded from 10M bytes to 169M bytes. Memory configurations range from 64K to 512K bytes of RAM. Mercator Business Systems, 1294 Lawrence Station Rd., Sunnyvale, CA 94086, (408) 734-5134.
CIRCLE INQUIRY NO. 333

Decision support system, FCS-EPS, is now available for the ONYX Timesharing Super Microcomputer. It is a comprehensive software system for decision support using financial modeling, "what-if" scenarios, pre-written functions and routines, simultaneous equation solution, non-procedural statements, text manipulation, indirect addressing of variables, data management, forecasting, editing and advanced programming capabilities using the FCS-EPS language. A host of pre-written functions exists for depreciation, loans, NPV, lead and lag of payments/receipts, rounding, column calculations, percentages, summaries, etc. Additional modules may be integrated for color graphics, hierarchical data management and consolidation, and a relational data base manager facility. Using FCS-EPS operating under the UNIX-compatible operating system on the ONYX Super Micro, it may have up to eight users on the same machine. Price: $6,000. EPS, 1788 Technology Dr., San Jose, CA 95110, (800) 538-7578.
CIRCLE INQUIRY NO. 334

Broker's information system, BIS, is an integrated, computer based, account management and reporting system designed for the retail securities business. It runs under the OASIS operating system. It is written in OASIS compiled Basic. It makes extensive use of ISAM file structures and other OASIS features to provide instant on-line data retrieval and display of client account information. An unusual feature is that the package introduces the concept of metered software. Licensees are billed each month for the amount of work the system actually performs. Information Technology, 5180 E. Main St., Columbus, OH 43213, (614) 866-9966.
CIRCLE INQUIRY NO. 335

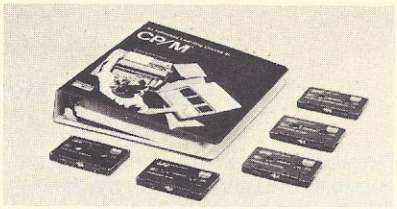
PERSONAL

Educational package, Pascal Tutor, includes a user's manual, program diskettes, and quizzes at the end of each chapter review. These reviews, quizzes and quiz reviews serve to reinforce the ideas and material covered in each chapter, making the package an understandable and thorough introduction to programming in the Pascal Language. The tutor not only introduces many of the fundamentals of UCSD Pascal, but provides a review tool for the more experienced programmer. Price: $125. The Denver Software Co., 14100 E. Jewell Ave., Suite 15, Aurora, CO 80012, (303) 750-9980.
CIRCLE INQUIRY NO. 366

Math series, Math Drills version 1.0 for the IBM Personal Computer, offers practice in addition, subtraction, multiplication and division, with randomly generated problems in any difficulty range. A user's scoreboard monitors number right, number wrong, average, speed, best prior average and best prior speed. In addition to the scoreboards, it uses 20 different reward messages, the sound of charge for every item answered correctly, and a song for every 20 correct. The software requires a 36K-byte IBM system with one disk drive and an 80-column monitor. Price: $39. Starware, Dept. P2, 3901 Davis Pl. NW, Washington, D.C. 20007.
CIRCLE INQUIRY NO. 367

Applications software, Grading Systems Program, is designed to accommodate a variety of different grade calculation schemes. It allows junior high schools, high schools and small colleges to maintain grade and credit information for such purposes as grade card preparation and master record maintenance. The program allows an Apple II computer to prepare report cards, file folder labels, synoptic records, grade labels, class rosters and honor rolls. The system is furnished with a specially designed light pen for easy entry of grades by para-professionals and others not familiar with computer keyboards. The system requires an Applesoft-equipped Apple II or Apple II Plus computer with 48K bytes of memory, a single disk drive and an 80-column printer. $299.95. Charles Mann & Assoc., 55722 Santa Fe Trail, Yucca Valley, CA 92284, (714) 365-9718.
CIRCLE INQUIRY NO. 368

CP/M course, EC-1120, is designed for first-time computer users. No previous background in CP/M or knowledge of Assembly Language is necessary to take the course. It is designed to teach how to operate CP/M-based applications programs and use the CP/M editor to create and manipulate text files. Written in an audio-tutorial format, the course includes a 500-page self-instruction text and five audio cassettes. Version 2.2 and earlier versions of CP/M, including built-in and transient commands, are covered in the ten units of the course. Among the



subjects covered are: the writing of basic commands, diagnosing causes for errors, using the Console Command Processor (CCP), transient programs, using the STAT and CONFIGUR commands, using the Peripheral Interchange Program (PIP) to transfer files from one disk to another, using ED (CP/M's text editor) to edit and manipulate files—and to create and use combined commands, and submitted command files with the XSUB and SUBMIT commands. Price: $99.95. Heathkit/Zenith Educational Systems, Dept. 350-415, Benton Harbor, MI 49022.
CIRCLE INQUIRY NO. 369

Fantasy/adventure programs for the Sinclair ZX81 Personal Computer have been created to operate with 16K bytes of memory. The games create a fantasy in which the player takes an active role in maneuvering through perilous situations to seek a solution or hidden treasure. The player becomes involved in shaping the fantasy story by using short English commands to move through rooms, tunnels and caves and manipulate objects and circumstances. Aside from being entertaining, these adventure programs are designed to challenge the player's ingenuity, strategic thinking and problem solving abilities. In Adventure A, the player is marooned on a strange planet and must escape by making the right combination of

decisions. Adventure B places the player at the entrance to a long lost Inca Temple with the challenge of finding the way through a tricky maze of tunnels and corridors to find a hidden treasure or risk being lost forever. Price: $19.95. Softsync, P.O. Box 480, Murray Hill Station, New York, NY 10156, (212) 685-2080.
CIRCLE INQUIRY NO. 370

Graphics software package, Graph, is now available for the Apple I. Graph can stand alone or interface directly with PFS data bases or Visicalc to produce bar, line or pie charts of presentation quality in minutes. Line and bar graphs can be mixed and matched, and up to four graphs can be displayed on a single set of axes. Bar graphs can be stacked or comparative. Other features include automatic formatting, scaling, legend labelling and pattern fill. Graph interfaces with a variety of printers including Silentype and Epson, as well as the HP 7470A plotter. Software Publishing Corp., 1901 Landings Dr., Mountain View, CA 94043. (415) 962-8910.
CIRCLE INQUIRY NO. 371

Space shuttle flight simulation, Rendezvous, designed by a NASA senior scientist, Wesley Huntress, simulates an actual space shuttle flight from Earth Liftoff, through Orbital Rendezvous and Approach, to Alignment and Docking. The system is available in Applesoft and Atari Basic. Rendezvous' high-resolution graphics and animation capture the drama and difficulty of space navigation. Shuttle liftoff and flight conditions are governed by gravitational forces, thrust and the player's own piloting skills. Distance and engine burn time (measured in kilometers and seconds) complicate orbital calculations. Throughout the final alignment and docking sequence, the player views the rotating, three-dimensional space station as it would appear through a space craft's anterior window. 3-D Solid-Structure Graphics bring to life the massive bulk and solidity of the station and docking bay. In a precisely timed operation, the player must maneuver his craft around the station and into the narrow, tunnel-like bay. Once docking is achieved, a sophisticated algorithm scores performance. Maneuvers are implemented with either keyboard or joystick controls. Rendezvous is recommended for individual players, 13 and over. Suitable for classroom application in General Science, Earth Science, and Physics. Price: $39.95. Edu-Ware Services, Box 22222, Agoura, CA 91301.
CIRCLE INQUIRY NO. 372

SYSTEMS

Application generator, Personal Pearl, enables users with no technical training or computer experience to describe their requirements visually and in English to the computer. With Personal Pearl, beginning end-users can generate their own library of horizontal and personal applications without being dependent on computer software technicians or on standard packaged programs. Price: $295. Relational Systems Int'l Corp., Box 13850, Salem, OR 97309, (503) 363-8929.
CIRCLE INQUIRY NO. 376

Operating system, Concurrent CP/M-86, allows a single-user to perform several jobs simultaneously. A user can print a file, enter information into a data base and receive electronic mail from a communications port at once. One can call up a directory without leaving the current program. Programmers can save time by compiling one segment of code while editing another. The user can go from one screen to another at the push of a key to monitor several operations running simultaneously. The product is compatible with CP/M-86, a 16-bit, single-user, single-tasking operating system, and MP/M-86, which permits more than one operator to use a single CPU simultaneously. It offers file-structure compatibility with all Digital Research operating systems, including CP/NET, which permits a number of separate computers to operate in a distributed processing network, and CP/M. Digital Research, Box 579, Pacific Grove, CA 93950, (408) 649-3896.
CIRCLE INQUIRY NO. 377

Software development tools, Introl-C, allow creation of C programs for 6809-based microprocessor systems. The set includes a C compiler, a 6809 assembler, an object code linker, and an object code library manager. The source code for the complete standard runtime library is included to allow the user to tailor developed programs to the specific target runtime environment. The compiler supports all standard C control structures, arithmetic and logical operators, and most forms of declarations. The only omissions from a full C implementation are long, floating, and enumeration data types, initializers, bitfields, and structures as function parameters. All preprocessor directives are supported except #line and #if (#ifdef and #ifndef are supported however). The compiler generates efficient 6809 assembly language that can be assembled using the included assembler. The code produced by the compiler is position independent and re-entrant, allowing programs to be produced for multi-tasking environments. The full Introl-C toolkit is available as a cross-compiler operating under CP/M or as a resident compiler operating under FLEX-09. The software is available on 8-in. CP/M or FLEX-compatible disks. Price: CP/M version $350, FLEX $300. Introl, 647 W. Virginia St., Milwaukee, WI 53204, (414) 276-2937.
CIRCLE INQUIRY NO. 378

Operating systems, MultI/OS and I/OS, can provide users of Radio Shack TRS-80 II with CP/M compatibility and additional functions. MultI/OS for the model II allows two or three users with added memory of 64K, 128K, or 196K bytes. Hard disk may be added for up to 40M bytes, with 63,000 files allowed. A two-station system with 10M bytes is also possible. Five additional user-programmable function keys are provided, and require no hardware change. Among other features are autostart capability, the ability to disable user abort sequences, directory status, disk copy and file transfer programs, disk and memory diagnostics and a printout formatting facility. MultI/OS and I/OS support up to 15 disk units and allow the mixing of 5-in. and 8-in. floppy and hard disks. The file directory utilizes systems buffers, which improve access speeds. MultI/OS allows up to 16 tasks simultaneously— any of which may run with a physical terminal or as a background job. MultI/OS provides for multiple printers with automatic spooling, record lock using FMM, 48K bytes per user, a full range of languages available including: Basic, Fortran, Pascal, Cobol, PL/I, C, and Z80 or 8080 Assembler. Infosoft Systems, 25 Sylvan Rd. S., Westport, CT 06880, (203) 226-8937.
CIRCLE INQUIRY NO. 379

Pascal compiler for CP/M, version 2, speeds the edit-compile-test development cycle. Separate external procedures and functions allow development of large programs. External procedures may be written in Pascal or assembly language (a special assembler is provided). The arithmetic provides 14 digits for business applications. Binary-coded-decimal format eliminates conversion errors. For scientific applications, the floating-point exponent ranges from −64 to +63. Dynamic text strings can be up to 64K bytes. Random disk files can be accessed by relative record number or relative byte address. Disk files can be processed as ASCII text or as binary data. Program development is speeded by line trace and procedure trace, which operate under program control. Verbal error messages are provided by the compiler and at runtime. Price: $295. JRT Systems, Box 22365, 1891 - 23rd Ave., San Francisco, CA 94122.
CIRCLE INQUIRY NO. 380

C compiler, OASIS C, for the OASIS multi-user operating system supports all features of Bell Laboratories' UNIX Version Seven C except floats, doubles, longs, multi-dimension arrays, fields, structure initializers or type definitions and type casts. Producing Z-80 assembler code, OASIS C includes an optimizer, which reduces the compiled code between 30% and 50%. Features include recursive nature, pointers and structures, assignment operators, complete I/O library and compiler options. Price: $250. Phase One Systems, 7700 Edgewater Dr., Suite 830, Oakland, CA 94621-3051, (415) 562-8085.
CIRCLE INQUIRY NO. 381

Programming language, RM/Cobol, enables TeleVideo computer users and software firms to develop applications programs that take advantage of the shared resource capability of TeleVideo's proprietary operating system. The software interface is incorporated in TeleVideo's version of RM/Cobol. Programs written in this language permit up to 16 users to share a central data base, while providing file protection for sensitive material. Price: $750 with compiler and run-time module. Televideo Systems, 1170 Morse Ave., Sunnyvale, CA 94086, (408) 745-7760.
CIRCLE INQUIRY NO. 382

Applications development language, Quic-N-Easi Version 1.3, incorporates several new features and a re-written manual. All programs written under previous releases will run under 1.3. The language unites formatted, edited, data entry with processing, printing and file handling. Quic-N-Easi runs under CP/M on most Z-80 based machines and on the TRS-80 model III without CP/M. It requires a minimum of 48K bytes of RAM. It will run on one floppy disk, but two are recommended. To edit input to the character level, the cursor is put at the location of the variable field and a function key is pressed. A form is displayed and the user fills in the blanks for field name, field length, attribute, justification, may enter, may tab, etc. This defines the field with no coding. The interpreter understands the contents of the variable field named on the screen as a program variable. The interpreter has a full set of commands including subroutines and loops. Quic-N-Easi has powerful file management capabilities that include index sequential file handling. Up to 20 files can be held open at the same time. Standard Microsystems, 136 Granite Hill Crt., Langhorne, PA 19047, (215) 968-0689.
CIRCLE INQUIRY NO. 383

Language version, Cobol 4.6, includes an Indexed Sequential Access Method (ISAM) that has been restructured to show improved execution time, a Common Runtime Library, and a Link-to-Disk linking loader enabling the user to link very large programs. It also features a symbolic interactive debugging facility. The new debugger provides English-word commands, and uses program data names as references in commands. It revolutionizes Cobol program development on micros by breaking the dump-change-run cycle, and by presenting data in a highly readable form. A utility program is included with 4.6 Cobol for converting ISAM files created under previous releases. A link-to-disk linking loader now accompanies the compiler, providing the capability to link very large programs. Under the link-to-disk linking loader, the size of the executable file is limited only by disk drive capacity. Microsoft, 10700 Northup Way, Bellevue, VA 98004.

UTILITY

SBasic I/O drivers for Cromemco systems feature a console driver, which in addition to the standard system, provides a non-destructive cursor back and forward movement, character insert and delete (with standard terminals such as the IQ 120), fast in-line cursor movement with TAB and HOME and a recall function that moves the contents of the line typed last into the current line. The cursor addressing feature of your terminal can be customized into the driver. Also available is an I/O driver that serves memory boards (RAM as well as ROM) as logical files. One can access up to 224K bytes (7 files, 32K bytes each) in a single-user system, holding data or programs for ultra-fast and reliable random or sequential access. This driver supports all boards with a bank-switch feature (at port 40h), such as the 64 KZ or the Measurement Systems & Control board. Prices: $25 for printer, $145 for the console driver including all listings. Tesco GmbH, Box 10, 8714 Wiesentheid, Germany, (Tel. 09383-1237). Or contact Albion Industries, Box 7, Millersville, MD 21108, (301) 923-2458.
CIRCLE INQUIRY NO. 390

Presentation graphics package, Executive Briefing System, is oriented to the business and professional user. It creates, organizes, and displays slide show presentations on the Apple II. It creates bootable diskette slide shows that run automatically or manually, using hand controllers or the keyboard to advance, backup or view individual slides. Run-time options of viewing time, multi-disk wrap-around, and special effects such as curtains, dissolves, spirals and cuts, may be specified prior to the show, or changed mid-show. It enables the user to add text or line drawings to hi-resolution images created by VisiPlot or other graphics packages, refining and enhancing existing charts and graphs. Text-only slides can also be created, using the eight custom-designed fonts included on the program diskette. The unit offers true color text fonts, proportional characters, and text positioning flexibility. The Draw feature enables the user to draw in any of the six Apple colors, creating borders, flow charts and diagrams. Price: $199. Professional Software Technology, 180 Franklin St., Cambridge, MA 02139, (617) 497-2077.
CIRCLE INQUIRY NO. 391

Operating system expander, Microshell, is a program that runs on any 8080/8085/Z-80 CP/M 2.2 system—bringing the power of the UNIX operating system to CP/M users and software developers. Microshell manages the interface between CP/M and the user to provide many of the best features of UNIX. Compatibility with CP/M programs is retained while the user can now type multiple commands on a line, send normal output to a file instead of the screen and take input from a file instead of the keyboard. Microshell performs automatic disk drive searches for the program to execute, virtually eliminating the need to use disk drive prefixes to filenames. Direct execution of commands from a file without using the SUBMIT facility is also provided. The UNIX pipe facility is implemented using temporary files. User-defined prompt with drive and/or user number, user-customized search path to accommodate any floppy or hard disk configuration and expanded submit facility, are other features. It is available on 5- or 8-in. disks with a comprehensive manual. Price: $150. New Generation Systems, 2153 Golf Course Dr., Reston, VA 22091, (703) 476-9143.
CIRCLE INQUIRY NO. 392

Graphics software, Graphics Magician, includes machine language routines that can be attached to your own programs to give arcade-quality animation, storage for hundreds of pictures on a single disk, and extended shape table features. The machine language animator employs the same techniques used in almost all popular Apple arcade games, and includes editors for pre-shifted shapes, paths, and animation of up to 32 independent objects. The picture/object editor allows you to create 100-color hi-res images in a form that makes hundreds quickly accessible from any program. The new Apple shape editor features use of all colors and angle preservation on rotation and scaling. A tutorial manual is included. Price: $59.95. Penguin Software, 1206 Kings Circle, West Chicago, IL 60185, (312) 231-0912.
CIRCLE INQUIRY NO. 393

Graphics software package, Execugraph, produces bar charts, line drawings, pie charts and histograms. Graphs and charts summarize masses of written data into graphic visual form. Types of information that Execugraph can translate from written to graphic form include current and historical information, trends in sales, profits, growth and marketing efforts. The presentation can be displayed on a CRT type terminal or chart plotter. Depending on output medium, these graphs can be displayed in several colors. A person does not need programming skills to operate the program. A brief question and answer dialogue will produce full documented graphs. It is capable of graph selection and storage, storage and retrieval of user-defind graph formats and separate data file entries for use with user-defined formats. It is capable of interface definition for external user programs and composite graphs (e.g. forecast vs. actual). The program is written entirely in Fortran-IV. It is supplied with user documentation and examples. Interactive Systems and Software, Box 348, Danvers, MA 01923, (617) 774-6703.
CIRCLE INQUIRY NO. 394

Hardware independent software, EPM version 1.1, permits the programming of EPROMs directly from CP/M disk files and allows existing EPROMs to be read directly to a disk file for archiving or duplication. Because EPM operates independently of any particular hardware configuration, it can interface with a wide variety of common EPROM programming systems including SD Systems PROM-100 board, Cromemco Bytesaver and Pro-Log. By using a control block to identify the particular type of EPROM to be programmed, EPM eliminates the need for address and length calculations and provides the flexibility to adapt to future EPROM developments. The program is menu-driven and requires a minimum of user interface. The EPM program automatically verifies EPROM erasure prior to programming. After programming, EPM provides confirmation of successful program transfer and reports discrepancies. A Hexrom utility is also included for hex file conversion. The program runs under CP/M version 2.0 or later with at least 24K bytes of RAM. EPM verison 1.1 is distributed on 8-in. single sided, single density diskettes. Price: $75. Dantek Software, 4550 Schoolhouse Rd., Batavia, OH 45103, (513) 752-1921.
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CALENDAR

Jun 5 Swapfest/Exposition, Minnesota State Fairgrounds, St. Paul, MN, will be the state's largest show for personal computer software and communication equipment. Amateur Fair, Box 30054, St. Paul, MN 55175.

Jun 6-8 Conference on Computers and Humanities, McKimmon Center, Raleigh, NC, will present a convention workshop and guest speakers. Dept. of English, N. Carolina State University, Raleigh, NC 27650.

Jun 6-9 Consumer Electronics Show, McCormick Place, Washington, D.C., seminars and exhibitions on a wide range of computer-related products, as well as other electronics merchandise. Consumer Electronics Shows, Two Illinois Center, Suite 1607, 233 N. Michigan, Chicago, IL 60601.

Jun 7-10 National Computer Conference, Astrodomain, Houston, TX, will display the latest advances in computer hardware, software and services. Will include technical sessions, speakers from both industry and government, and films relating to computer technology. American Federation of Information Processing Societies, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3610.

Jun 8-9 Confronting the Communications Revolution, McGraw-Hill World Headquarters Conference and Exposition Center, New York, NY, will discuss current and future industry changes. Hands-on strategy workshops will concern broadcasting, newspaper, consumer and trade publications, and information systems. Business Week Executive Programs, 1221 Ave. of the Americas, 40th Floor, New York, NY 10020, (212) 997-4930.

Jun 8-10 DSS-81, Colony Square Hotel, Atlanta, GA, conference on decision support systems, including executives, builders, MIS managers, products and services. DSS-81, Room 405, 146 Westminster St., Providence, RI 02903.

Jun 11-13 S. Florida Microcomputer Conference and Exhibition, BCC N. Campus, Ft. Lauderdale, FL, including a trade show, series of seminars, and used computer flea market. Applications include small business, word processing, education, science/engineering, consumer and hobbyist. Tom Blayney, Emergent, Inc., 9466 Saddlebrook Dr., Boca Raton, FL 33434, (305) 483-5248.

Jun 13-17 NCGA Conference, Convention Center, Anaheim, CA, third annual conference of the National Computer Graphics Assoc., including more than 20 tutorials, 60 technical sessions and 150 exhibits, highlighting computer graphics technologies. NCGA, 2033 M St. NW, Suite 330, Washington, D.C. 20036.

Jun 14-16 Design Automation Conference, Caesar's Palace, Las Vegas, NV, discussing the use of computers in design, synthesis and analysis, especially computer-aided design of digital systems. Bryan Preas, VR Information Systems, 5818 Balcones Dr., Austin, TX 78731.

Jun 20-Aug 6 Young people's Basic training camps, Lake Forest College, Lake Forest, IL, will give high school-aged students hands-on experience with computers. Camps are one week long and are open to students 12 to 18 years old. Lake Forest Computer Camp, Lake Forest College, Lake Forest, IL 60045.

Jun 28-30 Videotex '82, New York Hilton, New York, NY, will focus on international videotex developments, an analysis of why videotex is being used, and the range of marketing, technical and political factors on the industry. Online Conferences Ltd., Argyle House, Joel St., Northwood Hills, HA6 1TS, Middlesex, UK.

Jun 28-Jul 1 Conference on Precision Electromagnetic Measurements, National Bureau of Standards Laboratories, Boulder, CO, will deal with a variety of subjects, including the applicaiton of microprocessors. Arrangements Chairperson, CPEM 82, National Bureau of Standards, 1-4001, 325 Broadway, Boulder, CO 80303.

Jul 6-23 Program design course, State University, Fresno, CA, workshop emphasizing design and creation of user-friendly programs for use in the classroom. Courseware Magazine, 4919 N. Millbrook #222, Fresno, CA 93726.

Jul 19-21 Summer Computer Simulation Conference, Marriott City Center Hotel, Denver, CO, covering all aspects of simulation methodology and applications. Marlene M. Moller, Aerospace Corp., Box 92957, Los Angeles, CA 90009.

Jul 24-28 IACVB conference, Franklin Plaza Hotel, Philadelphia, PA, discussions of what high technology and telecommunications can do for the individual convention and visitor bureau. Int'l. Assoc. of Convention and Visitor Bureaus, 702 Bloomington Rd., Champaign, IL 61820.

BOOK REVIEWS

Introduction to Microcomputers
by Erik L. Dagless and David Aspinall
Computer Science Press, Rockville, MD

Reviewed by Dan W. Post

Efforts to animate matter-of-fact text are rare. Even elementary nuances of computer technology inhibit the development of exciting prose on the subject. Engineers, mathematicians and scientists seldom develop an accessible literary style. Although an effort has been made to develop appealing aesthetics for this textbook, the copy remains predictably sterile.

This should not be taken to imply that the content hasn't been intelligently and accurately compiled. All contributers emerge competent and reliable in their specialties, and the editors have assured a consistent terminology.

Because it attempts to provide a comprehensive overview by uniting several fragmented areas, the book can provide only a superficial treatment of some. The range of topics includes components for information processing, computer structure, the instruction set, applications, addressing modes, the processor-memory system, concurrency, support software, structured programming, applications and developmental environment.

Serious students and some business professionals may appreciate the straightforward approach of this text. Others —with a more casual interest—should seek lighter reading. The book is indexed, includes six appendices and a glossary.

233 pages $19.95

Understanding and Buying a Small-Business Computer
by Susan Blumenthal
Howard W. Sams, Indianapolis, IN

Are you being drawn to the mysteries of the CPU and CRT? If so, study this book first. *Before* you slip into a computer shop for a "quick demo." *Before* conferring with any type of consultant. Perhaps even before picking up a computer magazine.

An underlying commitment to objective, non-technical language—built on solid research—makes this an easy text for those with limited computer experience to digest in a short time.

The author's suggestions may help link the progressive, efficiency-minded businessperson with the rewards this medium can offer. Perhaps more importantly, some observations may discourage a potential implementation by illuminating misconceptions regarding the machine's capabilities. Her advice may also acquaint a prospective end-user with ways in which a business operation can prepare for future computerization.

157 pages $8.95 ***DWP***

Basic Computer Programs for the Home
by Charles D. Sternberg
Hayden Book Co., Inc., Rochelle Park, NJ

Reviewed by Rocky Smolin

Many consumers are struggling to find some remote rationalization to justify plunking down $1,000 to $3,000 for a home computer. Generally these justifications are opposed by a spouse who would rather blow the money on "luxuries" like food or clothes.

Well, here is the blasphemous but honest word on the subject: Most of the alleged "benefits" of home computing can actually induce trauma. Balancing a checkbook with a computer takes more time and causes more headaches than doing it manually. The same goes for recipe storage. How many million recipes does it take before the practical index card and box approach becomes unworkable? Does a computer really do a better job of calculating your car's gas mileage than the back of the envelope you've had stuck under the sun visor for the last two years?

For a glimpse at 81 things that might be better off *not* put on a computer, consult Sternberg's book. Here we have a collection of programs divided into ten categories: home financial programs, automobile-related programs, kitchen helpmates, scheduling programs, list programs for a variety of purposes, miscellaneous programs for the home, tutorial programs, conversion programs, recreational programs and hobbyist's diaries.

If you are holding out for *useful* home computer functions, you stand the best chance in the first section of the book—which contains programs for financial records, income tax recording and stock tracking. It also contains the obligatory checkbook balancer, and mortgage amount projections.

Kitchen helpmates assist the homemaker in meal and diet planning, freezer inventories and a supermarket list. Scheduling programs will arrange your TV viewing, chores, lawn and plant care. List programs will list your Christmas cards, addresses, collections and clubs. The diaries are broken into golf, fishing, photography, greenhouse, CB radio, bowling and a general purpose diary. None of these things really need to be done on a computer.

So why then does this book rate a favorable recommendation? Because there are at least five valid reasons for bringing a computer home. This book can help you to learn about the machine—make it part of the family. The first reason is: because you *want* a computer. Secondly, it is desirable to participate in the computer revolution—essentially to be in the mainstream of your culture. Third: you want your children to have the advantage of early exposure to computers. Fourth: to plug into the national information networks available to home computers. Finally, because you deserve a new toy, and there are few truly innovative diversions left.

Why should we buy Sternberg's book if we understand the marginal utility of the programs included?

The book is well put together. Each program is prefaced with a description, the functions of the program, instructions for use, some explanation of the data entry, the data formats, a description of the outputs and other comments. This is followed by a listing of the program, an example of what the screen prompts and outputs look like and a sample of the printed output.

Also, Hayden has assumed a unique marketing stance for this book. All the programs described are available on two 5¼-in. diskettes for $24.95. So far, they are available only in Apple II format; a spokesperson of the publisher was not optimistic about the eventual availability of other formats for other machines. However, for those with Apple IIs who do not want to key in the programs, here they are, already stored on a disk.

Perhaps most important, as a new computer user, you need to learn to program, which implies learning both the tricks and techniques of programming, and how to approach organizing the solution to a problem programmatically. To this end, Sternberg's book can be an invaluable aid. In the process of entering, studying, understanding, and maybe even using these programs, a better understanding of Basic programming will result. Having learned Basic, one can then modify and enhance these programs so that utility or entertainment applications are possible.

330 pages $10.95

Inventory Management for Small Computers
by Chuck Atkinson
Dilithium Press, Beaverton, OR

According to a *Time, Inc./Focus Research* study done in 1980 of over 1,700,000 small businesses, inventory control was cited as one of the three most important systems by only 26% of current users. Among possible purchasers, however, inventory control was at the top of the list, cited by 42% of respondents as one of the two most important applications.

There is a scarcity of good inventory control software for small computers compared to the abundance of standard accounting package offerings. Thus, this book is bound to become a valuable addition to the world of small business application software, containing not only a comprehensive and cogent description of an inventory control system, but the program listings as well.

Atkinson leads into his subject with a discussion first of inventory control basics, then a second chapter on inventory control by computer. Next is an operations manual for the parts operations program, liberally laced with figures showing the screen prompts and user responses, report samples, file layouts, and a complete program listing. Another chapter does the same for the parts file maintenance and construction program. Three chapters cover sorting, the Quick Register—a program that provides on-line update of the inventory files, and a printed sales receipt—and PAL, the parts sales analysis program. These programs are in CBasic. CBasic2, with its CHAIN command provides additional capabilities, so Atkinson provides the complete program CHAINED in CBasic2.

120 pages $16.95 **RS**

Problem-Solving on the TRS-80 Pocket Computer: A Self-Teaching Guide
by Don Inman and Jim Conlan
John Wiley & Sons, New York, NY

Reviewed by Bob McElwain

Here's a clear-cut presentation applicable to the Sharp PC-1211 as well as Tandy's popular product. The reader is guided through basic operation and then familiarized with more advanced features. Beyond elementary data handling, one encounters a formidable look at trig functions, sorting and searching, random numbers and interest computation.

Generally, a mathematically-biased approach has been applied—in some areas it is assumed the reader retains the principles of elementary trigonometry—the average consumer might not derive much benefit from this. The only real criticism on text quality is addressed to the time-pressured copy editor who missed a few glaring typos. But perhaps everyone knows the volume of a cylinder is given by $V = \pi R^2 H$ and not $V = R^2 H$.

255 pages $8.95

New Literature

Supplies and accessories for Apple, Atari, North Star, IBM systems and others are included in a four-color catalog. Media, cables-connectors, Datamaster work stations, books on hardware and software, and an extensive selection of supplies and display stations and printers are included. Free. Inmac, Dept. 59, 2465 Augustine Dr., Santa Clara, CA 95051.

CIRCLE INQUIRY NO. 201

Microcomputer system reference cards provide complete summaries of individual reference manuals and microcomputers. Fold-up size is 8 ½-in. by 3 ¼-in. Newly-released versions include TRS-80 color Basic ($4.95) and model II Basic and Assembler ($5.95). Versions for several other systems will be released soon. Nanos Systems Corp., Box 24344, Speedway, IN 46244.

CIRCLE INQUIRY NO. 202

DP Directory publishes the tables of contents of over 100 computer periodicals each month. Dozens of data processing magazines dealing with hardware, software, systems development, telecommunications, graphics, word processing and personal computing are included. Annual susbcription: $48. DP Directory, Box 562, Bloomfield, CT 06002.

CIRCLE INQUIRY NO. 203

Design and product capability are detailed in a free four-page brochure. It provides a problem-solving approach for implementing entire product line of fiber optics, miniature halogen and vacuum lamps and bar code identification systems. Contents include thorough product definitions and photos, as well as detailed application information. Welch Allyn, Industrial Products Div., Skaneateles Falls, NY 13153.

CIRCLE INQUIRY NO. 204

Software catalog includes over 100 investment analysis software packages for personal computers. The latest edition includes software programs for the Apple, Radio Shack and CP/M computers. The software packages range from option analysis, portfolio management, stock price trend forecasting, stock and option graphs, performance analysis, on-balance volume analyses of firms and market conditions, technical analysis, commodity analysis programs, charting and more. Price: $3. Wall Street Software, 71 Murray St., New York, NY 10007.

CIRCLE INQUIRY NO. 205

Apple Infocard features most Apple programming commands and error messages. It places the most commonly referred-to commands and error messages in an easy-to-read format for quick reference, eliminating turning pages in the user manuals. Price: $3.95. Irv Brechner Enterprises, Box 453, Livingston, NJ 07039.

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Micro Mathematician
Continued from page 34

THE MICRO-MATHEMATICIAN

```
30 PRINT "SIMULTANEOUS EQUATION TEST"
40 INPUT "NUMBER OF UNKNOWNS=",N
50 DIM A(N,N+1),Z$(1)
60 FOR I=1 TO N
70 PRINT "EQUATION ",I
80 FOR J=1 TO N
90 PRINT "COEFFICIENT OF X(",J,")=",
100 INPUT A(I,J)
110 NEXT J
120 INPUT "RIGHT HAND SIDE ELEMENT=",S
130 LET A(I,N+1)=S
140 NEXT I
150 LET Q=0 \ REM NO EXTRA ROWS
160 LET P=1 \ REM 1 RIGHT HAND SIDE
170 INPUT "DISPLAY MATRIX (Y OR N)?",Z$
180 GOSUB 1290
190 REM START SOLUTION WITH TRIANGULARIZATION
200 FOR I=1 TO N-1
210 REM PIVOTING SHOULD BE CALLED HERE
220 REM GOSUB 530

230 REM **********************
240 FOR K=I+1 TO N
250 LET S=-A(K,I)/A(I,I)
260 REM ELIMINATION
270 GOSUB 1010
280 REM
290 GOSUB 1290 \ REM DISPLAY
300 NEXT K
310 NEXT I
320 REM NOW BACK TRANSFORM IN GJ FASHION
330 FOR I=N TO 1 STEP -1
340 IF A(I,I)=1 THEN 420
350 REM DIAGONAL ELEMENT NOT 1 SO DIVIDE BY IT
360 LET K=I
370 REM TEST FOR SINGULAR MATRIX OF COEFFICIENTS
380 IF A(I,I)=0 THEN EXIT 640
390 LET S=(1/A(I,I))-1
400 GOSUB 1010
410 GOSUB 1290
```

Listing 1

```
1000 REM ELIMINATION SUBROUTINES
1010 REM ELIMINATION OPERATION ON ROWS
1020 REM ROW K REPLACED BY S TIMES ROW I PLUS ROW K
```

```
1030 IF S=0 THEN RETURN
1040 FOR J=1 TO N+P
1050   LET A(K,J)=A(K,J)+S*A(I,J)
1060 NEXT J
1070 RETURN
1080 REM ELIMINATION OPERATION ON COLUMNS
1090 REM COL K REPLACED BY S TIMES COL I PLUS COL K
1100 IF S=0 THEN RETURN
1110 FOR J=1 TO N+Q
1120   LET A(J,K)=A(J,K)+S*A(J,I)
1130 NEXT J
1140 RETURN
1150 REM PERMUTE ROW I,K
1160 FOR J=1 TO N+P
1170 LET S=A(I,J)
1180 LET A(I,J)=A(K,J)
1190 LET A(K,J)=S
1200 NEXT J
1210 RETURN
1220 REM PERMUTE COL I,K
1230 FOR J=1 TO N+Q
1240 LET S=A(J,I)
1250 LET A(J,I)=A(J,K)
1260 LET A(J,K)=S
1270 NEXT J
1280 RETURN
1290 IF Z$(1,1)<>"Y" THEN RETURN
1300 PRINT "MATRIX"
1310 FOR I1=1 TO N+Q
1320 FOR J1=1 TO N+P
1330 PRINT A(I1,J1),
1340 NEXT J1
1350 PRINT
1360 NEXT I1
1370 PRINT
1380 RETURN
```

Listing 2

```
10 PRINT "MATRIX ELIMINATION  820214"
20 REM GELIM  J C NASH
```

```
420 FOR K=I-1 TO 1 STEP -1
430 LET S=-A(K,I)
440 GOSUB 1010
450 GOSUB 1290
460 NEXT K
470 NEXT I
480 PRINT "SOLUTION"
490 FOR J=1 TO N
500 PRINT "X(",J,")=",A(J,N+1)
510 NEXT J
520 STOP
```

Listing 3

```
MATRIX ELIMINATION  820214
SIMULTANEOUS EQUATION TEST
NUMBER OF UNKNOWNS=2
EQUATION  1
COEFFICIENT OF X( 1)=?2
COEFFICIENT OF X( 2)=?3
RIGHT HAND SIDE ELEMENT=11
EQUATION  2
COEFFICIENT OF X( 1)=?4
COEFFICIENT OF X( 2)=?-1
RIGHT HAND SIDE ELEMENT=1
DISPLAY MATRIX (Y OR N)?Y
MATRIX
 2  3  11
 4 -1  1
```

```
MATRIX
 2 3 11
 0 -7 -21

MATRIX
 2 3 11
 0 .9999997 2.999999

MATRIX
 2 .0000009 2.000003
 0 .9999997 2.999999

MATRIX
 1 .00000045 1.0000015
 0 .9999997 2.999999

SOLUTION
X( 1)= 1.0000015
X( 2)= 2.999999
STOP IN LINE 530
READY
```

Listing 4. Elimination method for solving linear equations with pivoting

```
220 GOSUB 530
RUN

MATRIX ELIMINATION  820214
SIMULTANEOUS EQUATION TEST
NUMBER OF UNKNOWNS=3
EQUATION  1
COEFFICIENT OF X( 1)=?1
COEFFICIENT OF X( 2)=?1
COEFFICIENT OF X( 3)=?1
```

Listing 4. Elimination method for solving linear equations without pivoting

```
MATRIX ELIMINATION  820214
SIMULTANEOUS EQUATION TEST
NUMBER OF UNKNOWNS=3
EQUATION  1
COEFFICIENT OF X( 1)=?1
COEFFICIENT OF X( 2)=?1
COEFFICIENT OF X( 3)=?1
RIGHT HAND SIDE ELEMENT=1
EQUATION  2
COEFFICIENT OF X( 1)=?1
COEFFICIENT OF X( 2)=?1
COEFFICIENT OF X( 3)=?2


RIGHT HAND SIDE ELEMENT=2
EQUATION  3
COEFFICIENT OF X( 1)=?1
COEFFICIENT OF X( 2)=?2
COEFFICIENT OF X( 3)=?2
RIGHT HAND SIDE ELEMENT=1
DISPLAY MATRIX (Y OR N)?Y
MATRIX
 1 1 1 1
 1 1 2 2
 1 2 2 1



MATRIX
 1 1 1 1
 0 0 1 1
 1 2 2 1

MATRIX
```

```
 1 1 1 1
 0 0 1 1
 0 1 1 0

NUMERIC OV ERROR IN LINE 250
READY
```

Listing 5

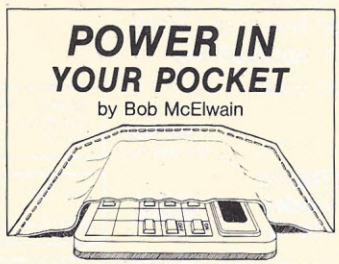
```
530 REM PARTIAL PIVOTING
540 LET K=I \ REM HYPOTHESIS FOR PIVOT
550 LET S=ABS(A(I,I))
560 FOR J=I+1 TO N
570 IF ABS(A(J,I))<=S THEN 600
580 LET S=ABS(A(J,I))
590 LET K=J \ REM POSITION OF NEW PIVOT
600 NEXT J
610 IF K=I THEN RETURN
620 GOSUB 1150
630 RETURN
640 PRINT "MATRIX IS COMPUTATIONALLY SINGULAR"
650 LET Z$="Y"
660 GOSUB 1290
670 STOP
```

```
RIGHT HAND SIDE ELEMENT=1
EQUATION  2
COEFFICIENT OF X( 1)=?1
COEFFICIENT OF X( 2)=?1
COEFFICIENT OF X( 3)=?2
RIGHT HAND SIDE ELEMENT=2

EQUATION  3
COEFFICIENT OF X( 1)=?1
COEFFICIENT OF X( 2)=?2
COEFFICIENT OF X( 3)=?2
RIGHT HAND SIDE ELEMENT=1
DISPLAY MATRIX (Y OR N)?N
SOLUTION
X( 1)= 1
X( 2)= -1
X( 3)= 1
STOP IN LINE 530
READY
```

Power in Your Pocket

Continued from page 43



Listing 1

```
 10: " "
   : PRINT "INDEX"
     - Set number of program variables.
   : A=14
     - Display options.
 50: PAUSE "OPS ARE D-ISPLAY N-EW"
   : PRINT "C-OMPUTE S-AVE L-OAD"
   : GO TO 50
     - Save data to tape.
100: "S"
   : PRINT # "IND"
   : STOP
     - Load data from tape.
200: "L"
   : INPUT # "IND"
   : STOP
     @@@  LIST DATA TABLE  @@@
300: "D"
     - Set flag for use of access data
       table routine for listing.
   : F=1
     - Start count of items.
   : K=0
     - Set index to two less than the
       first name in table.
   : J=A-1
     - Increment index to next element
       in the table.
310: J=J+2
     - Set item number for display.
   : K=K+1
     - Stop, if the last element has
       been listed.
   : IF J<=B THEN 500
320: PRINT "ENDLIST"
   : STOP

     @@@  EDIT DATA TABLE  @@@
400: "N"
     - Set flag to select edit in
       access data table routine.
   : F=0
     - Get an item to edit.
410: K=0
   : INPUT "ITEM #? ";K
     - Be sure entry is a positive
       whole number.
420: K=INT(ABS K)
     - Find actual position of item
       in array.
   : J=A+2K-1
     - If entry is within range, go to
       the access data table routine.
       52 should be 26 plus the number
       of memories available with the
       program loaded.
   : IF (J<=A)+(J>=52)=0 THEN 500
     - Here if out of range.
430: PRINT "NO SUCH #. REENTER"
   : GO TO 410
     @@@  ACCESS DATA TABLE  @@@
     - Break out data.
500: GO SUB 900
     - Display title as segment, sec-
       tion or item.
   : IF C=0 PRINT K;"ITEM: ";A$(J)

510: IF C=1 PRINT K;"SECT: ";A$(J)
520: IF C=2 PRINT K;"SEGM: ";A$(J)
     - Skip if listing.
530: IF F THEN 580
     - ENTER only will hold the pre-
       vious value.
540: INPUT "NEW HEAD? ";A$(J)
   : PRINT "NEW HEAD ";A$(J)
550: PRINT "HEADING TYPE ";C
     - This statement can be omitted.
560: PRINT "0=ITEM 1=SECTION 2=SEGMT"
   : INPUT "NEW HEADING TYPE? ";C
```

```
   : PRINT "HEAD TYPE NOW ";C
     - Be sure entry is a whole number.
570: C=INT C
     - Test to see if in range. Return
       if not.
   : IF (C<0)+(C>2)>0 THEN 550

580: PRINT "BASE=$";D
     - Skip if listing.
   : IF F THEN 610
590: INPUT "NEW BASE? $";D
   : PRINT "NEW BASE=$";D
     - Be sure entry is a positive
       whole number.
600: D=INT(ABS D)
     - Be sure entry does not exceed
       maximum.
   : IF D>9999 THEN 590
610: PRINT "CUR VAL=$";E
     - If listing, return for next
       item.
   : IF F THEN 310
620: INPUT "NEW CUR VAL? $";E
   : PRINT "NEW VAL=$";E
     - Exclude any entry less than
       dimes.
630: E=INT(10E+.5)/10
     - Be sure entry does not exceed
       maximum.
   : IF F>9999 THEN 620
     - Save edited values.  Data is
       held as CDDDD.EEEEE
640: A(J+1)=10000C+D+E/10000
     - Adjust maximum number of data
       elements.
   : IF J>B LET B=J
     - Return for further editing.
650: GO TO 410
     @@@  COMPUTE INDEX  @@@

700: "C"
     - Set for accumulation of total
       current values within a section.
   : H=0
     - Set for accumulation of total
       current values of sections and
       segments.
   : G=0
     - Set for accumulation of total
       base within a section.
   : M=0
     - Set for accumulation of total
       base of sections and segments.
   : L=0
     - Set index to first element in
       data table, less two.
   : J=A-1

     - Begin loop through data table.
710: J=J+2
     - Test for end-of-table.  If so,
       go to output totals.
   : IF J>B THEN 780
     - Break out data.
720: GO SUB 900
     - If all values are zero, heading
       has been deleted.  Return for
       next element.  NOTE: This posi-
       tion in the table remains avail-
       able for a new heading.
   : IF A(J+1)=0 THEN 710
725: IF C THEN 740
     - Here if element is an item in
       a section.  Accumulate current
       value.
730: H=H+E
     - Accumulate base.
   : M=M+D
     - Display totals and percent.
   : PRINT "ITEM: ";A$(J)
   : GO SUB 950
     - Return for another item.
   : GO TO 710
740: IF C>1 THEN 770
     - Here if a section heading en-
       countered.  Save section totals.
       Format is CDDD.EEEEE
750: D=M
   : E=H
   : A(J+1)=10000C+D+E/10000
     - Accumulate section base.
   : G=G+H
     - Accumulate section current value.
   : L=L+M
```

```
      - Reset for accumulations in next
        section.
760: H=0
   : M=0
      - Go to display section totals
        and percent.
   : PRINT "SECTION: ";A$(J)
   : GO SUB 950
      - Return for next element.
   : GO TO 710
      - Here if item is a segment.
        Accumulate current value.
770: L=L+D
      - Accumulate base.
   : G=G+E
      - Display segment totals and
        percent.
   : PRINT "SEGMENT: ";A$(J)
   : GO SUB 950
      - Return for next item.
   : GO TO 710
      - Here for final display.
780: PRINT "INDEX TOTAL"
      - Move L and G for computation
        and display.
   : D=L
   : E=G
   : GO SUB 950
   : STOP
      - Subroutine: Breakout data. Find
        flag for item (C=0), segment
        (C=1) or segment without any
        items.  (C=2).  Format saved is
        CDDDD.EEEEE
900: C=INT(A(J+1)/10000)
      - Find the base assigned.
   : D=INT A(J+1)-10000C
      - Find the current value assigned.
   : E=(A(J+1)-INT A(J+1))*10000
   : RETURN
      - Subroutine:  Display data.
950: PRINT "BASE=$";D
   : PRINT "CUR VAL=$";E
      - Compare current period to base
        as a percent.
   : N=E/D
960: N=INT(1000N+.5)/10
      - If an increase, subtract base
        and report change.
   : IF D<E LET N=N-100
   : PRINT "UP ";N;"%"
   : RETURN
      - Here, if no change in current
        period.
970: IF D=E PRINT "NO CHANGE" :RETURN
      - Compute percent of decrease
        and display.
980: N=100-N
   : PRINT "DOWN ";N;"%"
   : RETURN
999: END
```

Listing 2

```
(Use DEFine mode.)

SHIFT,SPC  (for Start and Menu)
INDEX
OPTS ARE D-ISPLAY N-EW
C-OMPUTE S-AVE L-OAD

SHIFT,N (for New Data)

ITEM #? 1

(Heading will be blank on the first run.)
1.ITEM:
(Use ENTER only to hold previous heading)
NEW HEADING? PAYMENT
NEW HEAD PAYMENT

HEADING TYPE 0.
0=ITEM 1=SECTION 2=SEGMT
(Use ENTER only to hold previous value.)
NEW HEADING TYPE? ENTER

BASE=$0.
(Use ENTER only to hold previous value.)
Note that the maximum value for the
base is $9999 and that any decimal
positions are discarded.)
NEW BASE? $374.
(Entry will be displayed only when a
new value is entered.)
NEW BASE= $374.

CUR VAL=$0
(Use ENTER only to hold previous value.
Note the maximum value is $9999. Tenth
of dollars will be retained; cents will
be discarded.)
NEW CUR VAL? $398.4
NEW VAL=$398.4
```

```
(Returns for entry of next item.)

ITEM #?

SHIFT,D (for display of data)

1.ITEM: PAYMENT
BASE=$394.
CUR VAL=$398.4

2.ITEM: UPKEEP
BASE=$94.
CUR VAL=$114.

3.SECT: HOUSING
(Note that a section (type 1) has
ended a set of items (type 0).)
BASE=$0.
CUR VAL=$0.
(Above amounts will be computed when
the index is computed.)

4.ITEM: FUEL
:
:
(Listing continues to end of data
table.)
:
:
12.SEGM: CONSTAN
BASE=$510.
CUR VAL=$522.4
```

```
SHIFT,C (for Compute Index)

ITEM: PAYMENT
BASE=$374.
CUR VAL=$398.4
UP 6.5%

ITEM: UPKEEP
BASE=$94.
CUR VAL=$114.
UP 21.3%

(Section totals follow.)
SECTION: HOUSING
BASE=$468.
CUR VAL=$512.4
UP 9.5%
:
(Computation and display continues
to end of data table.)
:
SEGMENT: CONSTAN
BASE=$510.
CUR VAL=$522.4
UP 2.4%

TOTAL INDEX
BASE=$1629.
CUR VAL=$1809.7
UP 11.1%
```

Fortran

Continued from page 71

The inevitable error messages for improper use of Fortran can be difficult to understand. Recognition of compiler error differs from one version to another, and may not point to proper solutions. Errors in other code may cause the execution to halt where no coding error exists.

String variables require knowledge of the machine at a more intimate level than other languages, unless the Fortran version has been enhanced for them. The modification of string variables requires an understanding of the methods of storing alphabetic values as well as integer and floating point values.

Recognition of compiler error differs from one version to another...

A programmer can easily exercise bad programming methods using GO TO, with computed GO TO, with poorly documented logic flow, or with a lack of COMMENT statements to complete a task. This can make Fortran nearly as vile as APL or Assembly to maintain.

Why *use* Fortran?

Fortran makes many computations quickly, with efficient source code translation into machine language by the compiler. Its efficient handling of complex mathematics is one of its founding principles and most endearing traits for the engineering, scientific and financial communities.

There is an exceptionally wide range of software products based on Fortran. Valuable statistical packages and plotting routines have been built using Fortran. Programs are enormously successful for applica-

```
EDIT
Filename: MAIN/FOR$ (Escape character)
*I
00100           PROGRAM SAMPLE
00200           IMPLICIT DOUBLE PRECISION(T)
00300           COMMON INCL,TOTAL,AVG,COUNT
00400           CALL INIT
00500      100  CONTINUE
00600           CALL DATAIN(AMT,IEND)
00700           IF(IEND.EQ.999) GO TO 200
00800           INCL=INCL+1
00900           TOTAL=TOTAL+1
01000           GO TO 100
01100      200  WRITE(1,300) INCL
01200      300  FORMAT(' NUMBER OF ITEMS ENTERED ',I6)
01300           IF(INCL.EQ.0) INCL=1
01400           AVG=TOTAL/INCL
01500           WRITE(1,303) TOTAL,AVG
01600      303  FORMAT(' THE TOTAL OF ALL ITEMS ENTERED IS
                ',F10.2
01700          - /' GIVING AN AVERAGE OF ',F10.4/)
01800           STOP
01900           END
02000 $  (Escape Character)
*E


EDIT
Filename: INIT/FOR$ (Escape Character)
*I
00100           SUBROUTINE INIT
00200           IMPLICIT DOUBLE PRECISION(T)
00300           COMMON I,T,A,C
00400           I=0
00500           A=0.
00600           C=0.
00700           T=0.D0
00800           RETURN
00900           END
01000 $ (Escape Character)
*E
EDIT
Filename: DATAIN/FOR$ (Escape Character)
*I
00100           SUBROUTINE DATAIN(A,I)
00200           I=0
00300           READ(1,300,END=30) A
00400      300  FORMAT(F8.4)
00500           IF(A.EQ.0.) I=999
00600           RETURN
00700      30   I=999
00800           RETURN
00900           END
01000 $ (Escape Character)
*E
```

Figure 1. Program compilation

```
Address       Content

0000H-27FFH   Operating System
3000H         Start of COMMON Block
              Variables local to MAIN program
              Program code of MAIN program (Transfer Address)
              Variables local to INIT
              Program code of INIT subroutine
              Variables local to DATAIN
              Program code of DATAIN
FFFFH         Top of memory
```

Figure 2. Example of program structure

tions such as real-time simulation, CAD/CAM, actuarial valuation, engineering design, optics, structural analysis, linear equations and other computation intensive problems. Major manufacturers such as CDC, Cray, Digital, Prime, SEL and others have offered machines especially for the Fortran market.

The widest range of mathematical routines comes from Fortran—the first language easy enough for mathematicians to use. A student in any college mathematics department can pick up its fundamental features and apply the algebraic techniques it encourages.

Solving complex problems, creating modular programs and structuring solutions are primary attributes. The designer can specify a task to be performed at the highest possible level of overview and develop the subprogram modules independently of the main program. This allows a senior project designer to delegate responsibility within a programming team.

For these reasons, Fortran will be a very vital programming tool in the future. However, in the microcomputer field, it is important to recognize some of the prohibitive aspects that can discourage its use.

The choices of Fortran compilers on the market must start with Microsoft. Its product is the most likely to be found on a microcomputers. Other firms offer similar products, including features omitted from the Microsoft version, but none have the support of so many important manufacturers. For example, a new release known as SSS Fortran is available. In addition, Data General has released a version for its microcomputer line.

Z80 and 8080 version

The Microsoft version, adapted by Tandy for the TRS-80 models I and II, consists of a source code editor, a compiler and a link editor. This is the version of Fortran for virtually all other Z80 and 8080-based microcomputers on the market today.

The Edit-80 source code editor accepts disk file input written to its specifications, and can accept an ASCII file and number it automatically. The program lacks features such as the potential for insertion of program statements from an independent disk file, or the ability to extract only a portion of a program to a disk file.

Edit-80 features are familiar to Microsoft Basic users with insert, delete, replace and alter options for lines, and insert, delete, change, search, delete and input, and append features. A Fortran compiler can read the resulting file upon completion of the editing process. Compilation of a program is illustrated in figure 1.

Routines can be compiled using the compiler program F80. This program has two useful options, allowing either single line commands or multiple compilations. It would also be helpful to programmers if multiple files could be compiled in a single command by referring to a list of file names.

```
F80
=MAIN
=INIT
=DATAIN
$ (Break Character)
```

The results are found in three files MAIN/REL, INIT/REL and DATAIN/REL.

Compiled routines are linked into a program. Linkage, using the L80 program, allows a programmer to unite program modules interactively, with reference to all unsatified program references (program units not yet linked).

Unfortunately, it is not possible to use a macro instruction or a list of modules from a disk file when several routines are to be linked. During program development, this creates a time-consuming job of retyping all module names whenever a change is made.

The command link to the /REL files into a program is:

```
L80 MAIN-N,MAIN,INIT,DATAIN-E
```

The results of the link step produce a machine-executable file called MAIN containing the program MAIN, the two subroutines INIT and DATAIN, and the system routines from the library. This process creates an executable program from the Fortran source code statements, one that will produce an average and a summation of any non-zero values. The program, when loaded into memory, has the structure displayed in figure 2.

The example shows some of Fortran's positive features, such as modular construction, reusable variable names and line numbers, and transfer of variables between routines in either of two methods—COMMON blocks or argument lists. These features allow construction of progressively more complex programs as needs change.

One of the challenges of Fortran programming is in error correction. Simple errors include failure to close parentheses, failure to specify the proper type of value in a function, failure to start statements in or after column 7 and before column 73, and forgetting line number references. A compiler can usually catch and fix these kinds of problems. Similarly, failure to link all subprogram modules is easily caught in the linker.

Scientists, engineers and mathematicians have requested and received many improvements...

The difficulties usually emerge at execution time. The entanglements come with illegal data in input fields, subscript overflows of arrays, or overflow and underflow of data items. Such problems as zero divide and failure to initialize can also be troublesome. Some of Fortran's advanced implementations can help solve these problems by subscript checking, expanded format options, cross reference listings and similar programming tools—but these options are not in the Microsoft implementation.

In the world of commercial computing, especially in the scientific, engineering and mathematical disciplines, Fortran users have requested and received many improvements to improve their productivity.

One such refinement is source code maintenance. Manufacturers have packages (UPDATE on Control

Data, PMF on IBM), as do independent software houses for storing, retrieving, selective insertion or omission of source code statements. The use of such facilities allows programmers to develop and enhance their program libraries from simple to highly complex applications as knowledge and experience grow. Similarly, software houses can take advantage of these tools to maintain packages on multiple data centers, where different peripherals, CPUs and language versions have been implemented.

Another feature of commercial Fortran is a large library of utilities, for such purposes as CPU usage monitoring, day, date and time of day, multiple process jobs, interactive debugging and file handling. The advantage of such tools is the ability of the programmer to expand software flexibility.

Large scale Fortran systems have another useful feature—the overlay (virtual memory processor). When a program is too big for memory, the programmer can segment the logic into smaller units and pass variables between them with COMMON blocks or with arguments on the CALL statement. The subprogram modules pass between disk and central memory as they are called. Allowable program size is thus multiplied many times over, although data storage size may still be limited.

Even with its apparent limitations, Fortran will probably never be obsolete

Frequent Fortran enhancements offer another attribute. Fortran 77, an enhanced release of the 1966 version with many of the features of structured languages, was the result of many hours of committee effort. For example, IF...THEN...ELSE and WHILE...ENDW features were added. In some implementations, the restrictions of syntax were relaxed to allow free format programs, alphabetic labels and expanded output format options similar to Cobol and Basic.

But what do these features mean in the microcomputer world? Unfortunately, very little! The major competitors in the microcomputer field include Tandy, Apple, Commodore, Digital, Data General, Hewlett-Packard, IBM, Xerox and CDC. I personally doubt that Tandy, Apple and Commodore—the original hobbyist firms—want to enhance their language products significantly. However, Digital, Data General and Hewlett-Packard have made some advanced features available on their machines. The Data General MP series features overlays, chaining and swapping of programs. Based on a 16-bit processor, this line has some excellent features for the serious Fortran programmer. Unfortunately, the Data General lines are not in the mainstream of microcomputer growth—being essentially scaled down versions of the company's minicomputers. As a result, the pricing structure and operating systems are not competitive against many of the popular machines.

IBM, Xerox and CDC have a real opportunity to make Fortran a more popular standard for microcomputers. The mainframe manufacturers have depth of talent in language maintenance and a major stake in keeping a share of the market. Many of their customers are loyal and will buy only through them, but certain characteristics limit their ability to make Fortran widely available. One is the traditional marketing strategy of parochial support for only their own architecture. Another emerges through the obvious limitations inherent in the bureaucratic process of decision making. Their marketing strategy will probably not encourage a transportable software product.

Even with its apparent limitations, Fortran will probably never be obsolete. With more than a decade of compounded experience, there are several thousand lines of Fortran source code available to do many types of computing. There is little incentive to convert existing program modules to another language. If popular micros supported certain mainframe features, Fortran would quickly emerge from relative obscurity. □

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PL/I-80

Continued from page 71

(Pacific Grove, CA) the advanced programming features of PL/1 are available for the first time on microcomputers.

One powerful feature in this micro version of PL/1 is its ability to perform both fixed decimal and floating point binary operations under programmer control. This makes PL/I-80 particularly useful in business and commercial processing.

In most languages, the programmer has no command over the internal format used for numeric processing. Therefore, the programmer has no control over truncation errors that might arise during internal conversion from binary to decimal operations. These errors are magnified in business and commercial applications because of the need for monetary accuracy.

Differences between the way application programs process data and the way computers perform arithmetic operations make conversion necessary. Internally, computers may perform operations in binary *or* decimal numbers, not in both. They generally perform in binary because binary data can be processed directly by most processors.

Commercial programs, on the other hand, usually process decimal values, so those values must be converted to binary on input and converted back to decimal on output.

The problem of truncation errors is compounded by differences in internal number formats between languages. For example, among two of the most popular Basic interpreters for microcomputers, one performs calculations using floating point binary while the other uses decimal arithmetic. Pascal language translators generally use implementation-defined precision, while Fortran always performs arithmetic using floating or fixed-point binary.

Cobol, designed specifically for commercial applications in which exact figures must be maintained throughout computations, uses decimal arithmetic.

The two short programs in figure 1 illustrate the essential difference between the two computational forms: decimal and binary. The programs perform the simple function of summing the value 3.10 a total of 10,000 times. The only difference between these programs is that dec-comp computes the results using a *fixed* decimal variable while bin-comp does it with *floating* point binary.

Dec-comp produces the correct result, 31000.00, while bin-comp produces only an approximation, 30997.30. The difference is a result of internal truncation that occurs when certain decimal constants, such as 3.10, are converted to binary approximations. The decimal .10 cannot be represented as a finite binary fractional expansion; that is, 3.10 is approximated as 3.099999E+00 in floating point binary. Each addition propagates a small error into the sum that is compounded by the number of additions. In scientific applications, inherent truncation errors are often insignificant and ignored, but such errors are unacceptable in commercial and business applications.

PL/I-80 gives a programmer the choice between decimal and binary representations so that each program can be tailored to a particular application's exact needs. It converts the internal format of the program in two steps. It first converts values to character format and then converts to either fixed decimal or floating point binary, depending on the requirements of the application.

To prevent truncation of digits, which occurs in the least significant position, PL/I-80 considers all digits in a computation equally significant. Since all digits are significant, the programmer must keep track of the range of values that arithmetic operands can take on.

To do this, decimal variables and constants in PL/I-80 have both precision and scale. Precision denotes the number of digits in the variable or constant, while scale denotes the number of digits in the fractional part. Fixed decimal variable and constant precisions must not

```
dec_comp:
    proc options(main);
    dcl
        i fixed,
        t decimal(7,2);
    t = 0;
        do i = 1 to 10000;
        t = t + 3.10;
        end;
    put edit(t) (f(10,2));
    end decimal_co p;
```

```
bin_comp:
    proc options(main);
    dcl
        i fixed,
        t float(24);
    t = 0;
        do i = 1 to 10000;
        t = t + 3.10;
        end;
    put edit(t) (f(10,2));
    end bin_comp;
```

Figure 1. Differences between decimal and binary

```
                    L O A N   P A Y M E N T   S U M M A R Y

                Interest Rate 14.00%      Inflation Rate 00.00%

|Date |  Principal   |Plus  Interest|  Payment  |Principal Paid|Interest Paid |
|12/80|$   2,890.97|$       33.73|$    144.03|$       219.33|$        68.73|
|12/81|$   1,479.02|$       17.26|$    144.03|$     1,647.75|$       368.67|
|11/82|$       0.25|$        0.00|$      0.25|$     3,000.00|$       456.97|
```

```
Principal      ,
Interest       ,
Payment        ,
%Inflation     ,
Starting Month ,
Starting Year  ,
Fiscal Month   ,

Display Level
Yr Results : 0
Yr Interest: 1
All Values : 2 1
```

Figure 2. Loan payment computation

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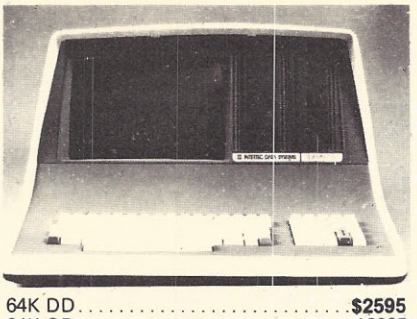

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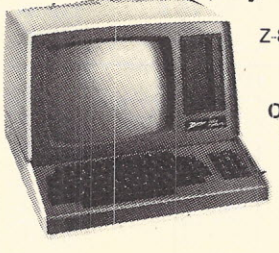

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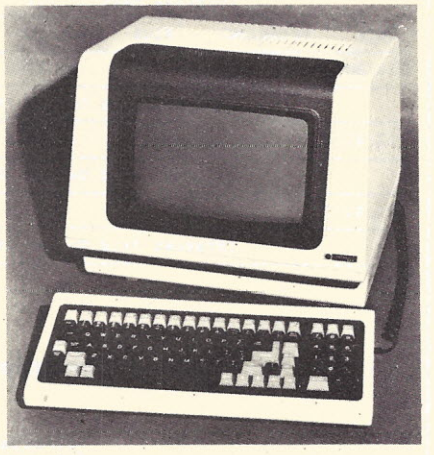

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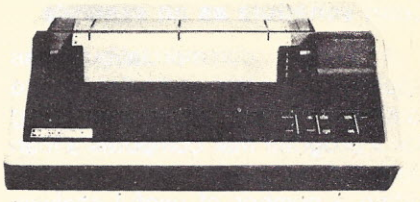

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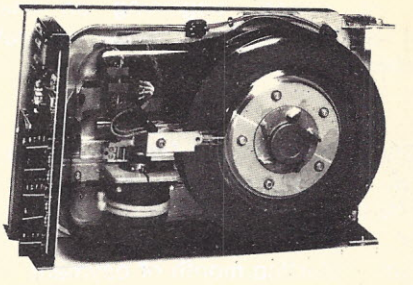

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exceed 15, and the scale must not exceed the precision. The precision and scale of a PL/I-80 variable are defined in the variable's declaration:

```
declare x fixed decimal (10, 3).
```

The precision and scale of a PL/I-80 constant are derived by a compiler counting the number of digits in the constant and the number of digits following the decimal point. For example, the constant (– 324.76) has precision 5 and scale 2. Internally, fixed decimal variables and constants are stored as binary-coded decimal (BCD) pairs, where each BCD digit occupies either the high or low order four bits of each byte.

Loan schedule as an example

A typical commercial/business application for this particular feature is shown in the accompanying listing for a program that computes a loan payment schedule, while incorporating a number of useful analysis and display formats.

In simplified terms, the algorithm incorporated into this program to compute the loan payment schedule uses three input values: principal (P), the yearly interest rate (i) and the monthly payment (PMT). Each month the remaining principal is computed as:

$$P + i * P \qquad (1)$$

and is then reduced by the payment amount, producing a new principal for the next month:

$$Pn = (Po + i * Po) - PMT \qquad (2)$$

As shown, beginning on line 116, this program reads several data items:

PV: present value (initial principal);
yi: yearly interest rate;
PMT: monthly payment;
ir: yearly inflation rate;
sm: starting month of payment (1 - 12);
sy: starting year of payment (0 - 99);
fm: fiscal month (end of fiscal year, 1 - 12); and,
dl: display level (0 - 2).

The initial principal and payment variables are declared as fixed decimal (10, 2), allowing values as large as $99,999,999.99. The yearly interest rate and yearly inflation rate are expressed in percentages as large as 99.99, as defined on lines 24 and 29. The month and year variables, sm, sy and fm, are in fixed binary format and are assumed to properly represent month and year values. The variable dl defines the amount of information displayed during a particular iteration of the program, where 0 provides the abbreviated display, 1 provides additional information and 2 gives the full trace.

Using an algorithm similar to the one described in equations 1 and 2, the primary loop in the program occurs between lines 96 and 131, where the principal is increased by

```
                    L O A N   P A Y M E N T   S U M M A R Y

                Interest Rate 14.00%      Inflation Rate 00.00%

Date |  Principal   |Plus  Interest|  Payment  |Principal Paid|Interest Paid
12/80|$    2,890.97|$       33.73|$    144.03|$       219.33|$       68.73
                Interest Paid During '80-'80 is        $68.73
12/81|$    1,479.02|$       17.26|$    144.03|$     1,647.75|$      368.67
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11/82|$        0.25|$        0.00|$      0.25|$     3,000.00|$      456.97
                Interest Paid During '82-'82 is        $88.30
```

Figure 3. Execution of the main loop

```
Principal      ,
Interest       ,
Payment        ,
%Inflation     ,
Starting Month ,
Starting Year  ,
Fiscal Month   ,

Display Level
Yr Results : 0
Yr Interest: 1
All Values : 2 2
```

```
                    L O A N   P A Y M E N T   S U M M A R Y

                Interest Rate 14.00%      Inflation Rate 00.00%

Date |  Principal   |Plus  Interest|  Payment  |Principal Paid|Interest Paid
11/80|$    3,000.00|$       35.00|$    144.03|$       109.03|$       35.00
12/80|$    2,890.97|$       33.73|$    144.03|$       219.33|$       68.73
                Interest Paid During '80-'80 is        $68.73
01/81|$    2,780.67|$       32.44|$    144.03|$       330.92|$      101.17
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03/81|$    2,556.19|$       29.82|$    144.03|$       558.02|$      162.13
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12/81|$    1,479.02|$       17.26|$    144.03|$     1,647.75|$      368.67
                Interest Paid During '81-'81 is       $299.94
01/82|$    1,352.25|$       15.78|$    144.03|$     1,776.00|$      384.45
02/82|$    1,224.00|$       14.28|$    144.03|$     1,905.75|$      398.73
03/82|$    1,094.25|$       12.77|$    144.03|$     2,037.01|$      411.50
04/82|$      962.99|$       11.23|$    144.03|$     2,169.81|$      422.73
05/82|$      830.19|$        9.69|$    144.03|$     2,304.15|$      432.42
06/82|$      695.85|$        8.12|$    144.03|$     2,440.06|$      440.54
07/82|$      559.94|$        6.53|$    144.03|$     2,577.56|$      447.07
08/82|$      422.44|$        4.93|$    144.03|$     2,716.66|$      452.00
09/82|$      283.34|$        3.31|$    144.03|$     2,857.38|$      455.31
10/82|$      142.62|$        1.66|$    144.03|$     2,999.75|$      456.97
11/82|$        0.25|$        0.00|$      0.25|$     3,000.00|$      456.97
                Interest Paid During '82-'82 is        $88.30
```

Figure 4. Full display of data

```
Principal       ,
Interest        ,
Payment         ,
%Inflation      10
Starting Month  ,
Starting Year   ,
Fiscal Month    10

Display Level
Yr Results : 0
Yr Interest: 1
All Values : 2 2
```

LOAN PAYMENT SUMMARY					
Interest Rate 14.00%			Inflation Rate 10.00%		
Date	Principal	Plus Interest	Payment	Principal Paid	Interest Paid
11/80	$ 3,000.00	$ 35.00	$ 144.03	$ 109.03	$ 35.00
12/80	$ 2,864.95	$ 33.42	$ 142.73	$ 217.35	$ 68.11
01/81	$ 2,733.39	$ 31.88	$ 141.58	$ 325.29	$ 99.45
02/81	$ 2,602.35	$ 30.36	$ 140.42	$ 432.71	$ 129.00
03/81	$ 2,471.83	$ 28.83	$ 139.27	$ 539.60	$ 156.77
04/81	$ 2,341.85	$ 27.32	$ 138.12	$ 645.94	$ 182.80
05/81	$ 2,212.44	$ 25.81	$ 136.97	$ 751.71	$ 207.08
06/81	$ 2,083.60	$ 24.31	$ 135.82	$ 856.90	$ 229.65
07/81	$ 1,955.36	$ 22.81	$ 134.66	$ 961.48	$ 250.52
08/81	$ 1,829.70	$ 21.34	$ 133.65	$ 1,066.60	$ 269.99
09/81	$ 1,702.58	$ 19.86	$ 132.50	$ 1,170.05	$ 287.52
10/81	$ 1,576.11	$ 18.38	$ 131.35	$ 1,272.85	$ 303.41
Interest Paid During '80-'81 is				$332.69	
11/81	$ 1,451.91	$ 16.94	$ 130.34	$ 1,376.48	$ 318.02
12/81	$ 1,326.68	$ 15.48	$ 129.19	$ 1,478.03	$ 330.69
01/82	$ 1,203.50	$ 14.04	$ 128.18	$ 1,580.64	$ 342.16
02/82	$ 1,079.56	$ 12.59	$ 127.03	$ 1,680.87	$ 351.67
03/82	$ 957.46	$ 11.17	$ 126.02	$ 1,782.38	$ 360.06
04/82	$ 835.87	$ 9.74	$ 125.01	$ 1,883.39	$ 366.92
05/82	$ 714.79	$ 8.34	$ 124.00	$ 1,983.87	$ 372.31
06/82	$ 594.25	$ 6.93	$ 123.00	$ 2,083.81	$ 376.22
07/82	$ 474.26	$ 5.53	$ 121.99	$ 2,183.19	$ 378.66
08/82	$ 354.84	$ 4.14	$ 120.98	$ 2,281.99	$ 379.68
09/82	$ 236.02	$ 2.75	$ 119.97	$ 2,380.19	$ 379.27
10/82	$ 117.80	$ 1.37	$ 118.96	$ 2,477.79	$ 377.45
Interest Paid During '81-'82 is				$124.28	
11/82	$ 0.20	$ 0.00	$ 0.20	$ 2,457.00	$ 374.25
Interest Paid During '81-'82 is				$0.00 •	

Figure 5. Loan with inflation adjustment

the monthly interest and reduced by the monthly payment until it becomes zero.

Figure 2 is a minimal display for a loan of $3,000 at 14% interest with a $144.03 monthly payment. In this case, a 0% inflation rate is assumed with a starting payment in November 1980 and end of the year taxes due in December of each year. The display indicates the principal, interest in December, monthly payment, amount paid toward principal in December, and the amount of interest paid in the last month of the fiscal year.

Figure 3 shows an execution of the main loop using the same values with a display level 1. In this case, the output also contains the yearly interest paid on the loan (which would presumably be deducted from taxable income) for each fiscal year.

Figure 4 uses the same initial values but provides full display of the monthly principal, interest, monthly payment, payment applied to the principal and interest payment.

The same loan and interest rate with an adjustment in dollar value due to inflation is shown in figure 5. A rather conservative 10% inflation rate is assumed, so that all amounts are scaled to the value of the dollar at the time the loan was issued. For tax reporting purposes, the display showing total interest paid at the end of the year is not scaled and does not match the sum of the interest paid during the year.

If we assume a zero inflation rate, the total loan payment is $3,456.97, taken from the previous output. Assuming an inflation rate of 10%, however, the total cost of the loan in today's dollars is

$$\begin{array}{r} \$2{,}457.00 \\ 374.25 \\ \hline \$2{,}831.25 \end{array}$$

resulting in a net gain of $68.75 over a two-year period. □

Program listing follows

PL/I-80

Program listing

```
 1 a 0000 pmt:
 2 a 0006      proc options(main);
 3 c 0006      %replace
 4 c 000D          true   by '1'b,
 5 c 000D          false  by '0'b,
 6 c 000D          clear  by '^z';
 7 c 000D      dcl
 8 c 000D          end bit(1),
 9 c 000D          m   fixed binary,
10 c 000D          sm  fixed binary,
11 c 000D          y   fixed binary,
12 c 000D          sy  fixed binary,
13 c 000D          fm  fixed binary,
14 c 000D          dl  fixed binary,
15 c 000D          P   fixed decimal(10,2),
16 c 000D          PV  fixed decimal(10,2),
17 c 000D          PP  fixed decimal(10,2),
```

```
 85 c 032E          get list(dl);
 86 c 0346          if dl < 0 | dl > 2 then
 87 c 0357              signal error;
 88 c 035E          m = sm;
 89 c 0364          y = sy;
 90 c 036A          IP = 0;
 91 c 037A          PP = 0;
 92 c 038A          YIN = 0;
 93 c 039A          if name ^= 'Scon' then
 94 c 03A8              put file(output) page;
 95 c 03BA          call header();
 96 c 03BD              do while (P > 0);
 97 c 03D3              end = false;
 98 c 03D8              INT = round ( i * P / 1200, 2 );
 99 c 0408              IP  = IP + INT;
100 c 0423              PL  = P;
101 c 0433              P   = P  + INT;
102 c 044E              if P < PMT then
103 c 0464                  PMT = P;
104 c 0474              P   = P - PMT;
105 c 048F              PP  = PP + (PL - P);
106 c 04B5              INF = ci;
107 c 04CA              ci = ci / fi;
108 c 04EA              if P = 0 | dl > 1 | m = fm then
109 c 0520                  do;
110 c 0520                  put file(output) skip
111 c 055B                      edit('|',100*m+y) (a,p'99/99');
112 c 055B                  call display(PL * INF, INT * INF,
113 c 0601                  PMT * INF, PP * INF, IP * INF);
114 c 0601                  end;
115 c 0601              if m = fm & dl > 0 then
116 c 061E                  call summary();
117 c 0621              m = m + 1;
118 c 0628              if m > 12 then
119 c 0634                  do;
120 c 0634                  m = 1;
121 c 063A                  y = y + 1;
122 c 064                   if y > 99 then
123 c 064D                      y = 0;
124 c 0656                  end;
125 c 0656              end;
126 c 0656          if dl = 0 then
127 c 065F              call line();
128 c 0665          else
129 c 0665          if ^end then
130 c 066C              call summary();
131 c 0672          end;
132 c 0672
133 c 0672      display:
134 c 0672          proc(a,b,c,d,e);
135 e 0672          dcl
136 e 067F              (a,b,c,d,e) fixed decimal(10,2);
137 e 067F          put file (output) edit
138 e 0731              ('|',a,'|',b,'|',c,'|',d,'|',e,'|')
139 e 0731              (a,2(2(p'$zz,zzz,zz9v.99',a),
140 e 0731                  p'$zzz,zz9.v99',a));
141 c 0731          end display;
142 c 0731
143 c 0731      summary:
144 c 0731          proc;
145 e 0731          end = true;
146 e 0736          call current_year(IP-YIN);
147 e 0757          YIN = IP;
148 c 0768          end summary;
149 c 0768
150 c 0768      current_year:
151 c 0768          proc(I);
```

```
18 c 000D          PL  fixed decimal(10,2),
19 c 000D          PMT fixed decimal(10,2),
20 c 000D          PMV fixed decimal(10,2),
21 c 000D          INT fixed decimal(10,2),
22 c 000D          YIN fixed decimal(10,2),
23 c 000D          IP  fixed decimal(10,2),
24 c 000D          yi  fixed decimal(4,2),
25 c 000D          i   fixed decimal(4,2),
26 c 000D          INF fixed decimal(4,3),
27 c 000D          ci  fixed decimal(15,14),
28 c 000D          fi  fixed decimal(7,5),
29 c 000D          ir  fixed decimal(4,2);
30 c 000D
31 c 000D      dcl
32 c 000D          name char(14) var static init('$con'),
33 c 000D          output file;
34 c 000D
35 c 000D      put list(clear,'^i^iS U M M A R Y   O F   P A Y M E N T S');
36 c 002F
37 c 002F      on undefinedfile(output)
38 d 0037          begin;
39 e 003A          put skip list('^i^icannot write to',name);
40 e 005F          go to open_output;
41 d 0062          end;
42 d 0062
43 c 0062      open_output:
44 c 0069          put skip(2) list('^i^iOutput File Name ');
45 c 0085          get list(name);
46 c 009F
47 c 009F      if name = '$con' then
48 c 00AD          open file(output) title('$con') print pagesize(0);
49 c 00CC      else
50 c 00CC          open file(output) title(name) print;
51 c 00E6
52 c 00E6      on error
53 d 00ED          begin;
54 e 00F0          put skip list('^i^iBad Input Data, Retry');
55 e 010C          go to retry;
56 d 010F          end;
57 d 010F
58 c 010F      retry:
59 c 0116          do while(true);
60 c 0116          put skip(2)
61 c 0132               list('^i^iPrincipal      ');
62 c 0132          get list(PV);
63 c 0151          P = PV;
64 c 0161          put list('^i^iInterest       ');
65 c 0178          get list(yi);
66 c 0197          i = yi;
67 c 01A7          put list('^i^iPayment        ');
68 c 01BE          get list(PMV);
69 c 01DD          PMT = PMV;
70 c 01ED          put list('^i^i%Inflation     ');
71 c 0204          get list(ir);
72 c 0223          fi = 1 + ir/1200;
73 c 0253          ci = 1.00;
74 c 0263          put list('^i^iStarting Month ');
75 c 027A          get list(sm);
76 c 0292          put list('^i^iStarting Year  ');
77 c 02A9          get list(sy);
78 c 02C1          put list('^i^iFiscal Month   ');
79 c 02D8          get list(fm);
80 c 02F0          put edit('^i^iDisplay Level  ',
81 c 032E               '^i^iYr Results : 0 ',
82 c 032E               '^i^iYr Interest: 1 ',
83 c 032E               '^i^iAll Values : 2 ')
84 c 032E              (skip,a);
```

```
152 e 0768         dcl
153 e 076F             yp fixed binary,
154 e 076F             I fixed decimal(10,2);
155 e 076F         yp = y;
156 e 0775         if fm < 12 then
157 e 0781             yp = yp - 1;
158 e 0788         call line();
159 e 078B         put skip file(output) edit
160 e 0804         ('|',' Interest Paid During ',yp,'-',y,' is ',I,'|')
161 e 0804         (a,x(15),2(a,p'99'),a,p'$$$,$$$,$$9v.99',x(16),a);
162 e 0804         call line();
163 c 0808         end current_year;
164 c 0808
165 c 0808     header:
166 c 0808         proc;
167 e 0808         put file(output) list(clear);
168 e 0822         call line();
169 e 0825         put file(output) skip edit
170 e 0860         ('|','L O A N   P A Y M E N T   S U M M A R Y','|')
171 e 0860             (a,x(19));
172 e 0860         call line();
173 e 0863         put file(output) skip edit
174 e 08E3         ('|','Interest Rate',yi,'%','Inflation Rate',ir,'%','|')
175 e 08E3             (a,x(15),2(a,p'b99v.99',a,x(6)),x(9),a);
176 e 08E3         call line();
177 e 08E6         put file(output) skip edit
178 e 0942             ('|Date |',
179 e 0942              '  Principal   |',
180 e 0942              'Plus  Interest|',
181 e 0942              '   Payment  |',
182 e 0942              'Principal Paid|',
183 e 0942              'Interest Paid |') (a);
184 e 0942         call line();
185 c 0946         end header;
186 c 0946
187 c 0946     line:
188 c 0946         proc;
189 e 0946         dcl
190 e 0946             i fixed bin;
191 e 0946         put file(output) skip edit
192 e 099E         ('--------','-------------',
193 e 099E             ('---------------' do i = 1 to 4)) (a);
194 c 099E         end line;
195 a 099E     end pmt;
```

```
        S U M M A R Y   O F   P A Y M E N T S

        Output File Name ,


        Principal       3000
        Interest        14
        Payment         144.03
        %Inflation      0
        Starting Month  11
        Starting Year   80
        Fiscal Month    12

        Display Level
        Yr Results : 0
        Yr Interest: 1
        All Values : 2 0
```

Fortran

Continued from page 71

in figure 1.

Show one column at a time to view the contents of the stack as you process the line from left to right. X indicates the stack as it exists; either empty or with one or more values from previous calculations. In columns B through F, imagine stacking dinner plates with numbers on them. One's plate goes lower on the stack as the others are added. The arithmetic operators atop columns G through J put one value on top for each two used, shortening the stack.

The numbers could be written as the names of variables, constants or subroutines: CALC1 CALC2 CALC34 VAR5 + – * –, with CALC1 and CALC2 being arithmetic subroutines each leaving one value on the stack, CALC34 leaving two, and VAR5 a variable or constant derived or declared elsewhere in the program.

Alternatively, the line could be written with operators and operands mixed: 5 4 + 3 – 2 * 1 – and the process displayed on the stack (figure 2). One gets the same result

While Forth usually includes an assembler as part of its dictionary, it may also extend itself

—shorter stack—but different temporary results. Circumstances would determine which order to use.

As written, neither example is bracketed with subroutine delimiters, so they are not Forth program lines. Either could be defined as a complete subroutine, or part of one.

At its core, Forth is a minimum set of command WORDS, a vocabulary of primitives used to define new words called secondaries. In the figure 2 example, +, –, and * are primitives, CALC1, CALC2 and so on would be secondaries.

From simple declarations to entire subprograms, secondaries may be subroutines in a particular program. They may be compiled, permanently or temporarily, into the language itself for use in command, program, or edit mode. The primitives and secondaries make up a dictionary the programmer expands or contracts as needed.

One way to extend TRS-80 model I Basic is programming SYSTEM routines in Z80 code. Such extensions become part of the computer operating system, regardless of changing programs, until power-down or erasure.

Most Basic dialects let programmers set up processes and equations for use as if they were defining functions of the language. From a function defined DEF FNA(X,Y) = (X/Y), then B = FNA(4,2) returns B = 2 in a program. These are single-use functions—they return one result to the main program and are not true subroutines.

If your computer lacks a clear-screen (CLS) command, it could be simulated by PRINT CHR$(28); CHR$(31), which puts the cursor in the upper left position and clears everything to the end of the video display. It could be defined as this function, DEF FNA$(X) = CHR$(28) + CHR$(31), and invoked by PRINT FNA$(0). Zero is a dummy argument.

To use the function in command mode, Basic requires that the function be defined in a program and run. However, EDITing the program, CLEARing it or LOADing another wipes the function from memory.

While Forth usually includes an assembler as part of its dictionary, Forth may also extend itself. Whether extensions are as fast or space efficient relative to Z80 coding or not, Forth is a faster tool than assembler or machine language.

Forth allows and encourages writing SYSTEM subroutines. They are immediately compiled into the language and usable until removed or until the computer is turned off, just as machine code SYSTEM routines. Such routines may be compiled permanently into the language and loaded whenever the system is booted up.

A minimum usable Forth operating system would have data input and

	1	2	3	4	5	+	–	*	–	:OPERATION
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	:(COLUMN)
(X)	1	2	3	4	5	9	6	12	11	:FIRST ON STACK
	(X)	1	2	3	4	3	2	1	(X)	:SECOND ON STACK
		(X)	1	2	3	2	1	(X)		:THIRD ON STACK
			(X)	1	2	1	(X)			:FOURTH ON STACK
				(X)	1	(X)				:FIFTH ON STACK
					(X)					:SIXTH ON STACK

Figure 1. Stack formation

	5	4	+	3	–	2	*	1	–	:OPERATOR
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(I)	(J)	(K)	:(COLUMN)
(X)	5	4	9	3	6	2	12	1	11	:FIRST ON STACK
	(X)	5	(X)	9	(X)	6	(X)	12	(X)	:SECOND ON STACK
		(X)		(X)		(X)		(X)		:THIRD ON STACK

Figure 2. Mixing operators and operands

output procedures, stack, symbol and memory minipulation, and two primitives: addition and subtraction. The user would derive secondaries such as multiplication, division or strings, from primitives and other secondaries.

For example, in Forth, addition returns the sum of the top two values on the stack: n1 n2 + returns SUM1 (n1 + n2) on top. Here is one Forth definition of a multiplication function.

```
: MULTIPLY OVER 0 =
    IF DUP ROT 1
        DO OVER +
        LOOP SWAP DROP
    ELSE DROP DROP 0
    ENDIF ;
```

It would be called as a subroutine by n1 n2 MULTIPLY. For simplicity, it is an integer-only routine that returns zero for multipliers, n1, less than + 1. The colon signals that it is a definition, and the semi-colon terminates it like the period closing this sentence. The semi-colon is analogous to RETURN in Basic program subroutines.

For Z Y MULTIPLY (Z times Y), if Z is greater than 0, a graph of the first three lines of MULTIPLY would look like the configuration in figure 3.

Columns A to C show Z and Y on the stack when MULTIPLY is called. OVER in column D copies the second value on the stack and puts it on top. When zero is put on top of the stack, the comparator (is greater than, =) evaluates it with the value below and replaces them with a flag [+ 1] for true or [zero] for false. If that value on top of the stack is + 1, indicating Z = 0, the IF removes the + 1 to continue with the IF clause.

Note that a comparator actually puts a number on the stack. It's an operation, not a decision. IF is the decision maker. The flag IF uses can come from a comparator operation or any other legal stack manipulation. This isn't a Forth tutorial, so suffice it to say that programmers have more flexible control of a program's flow with this separation of functions.

DUP, above column H, duplicates the top value, and ROT, in column I, rotates the third position to the top. The 1 on the stack in column J is the initial value of the loop counter or index. DO removes the two top values (Z and 1) to a separate return or loop process stack.

Within the loop, OVER duplicates the second value to the top, and the two top values are then added (column M). When the loop reaches the limit Z in column N, SWAP in column O reverses values and DROP in column P ejects the top of the stack, eliminating an unnecessary value. Notice that ROT and SWAP rearrange the stack without changing its height.

If the flag in column F were zero, processing would skip to the ELSE clause and drop the multiplication values. "Then" returns zero to the program by placing a zero on top of the stack.

In Forth, addition returns the sum of the top two values on the stack

Figure 4 shows the multiplication with real numbers, 3 4 MULTIPLY (which is three four times).

Up to column M, this table is like the generalized example. In M, on the index stack, the index or loop counter (1 at the time) increments by 1 and is compared to the loop limit. Since 2 is less than 3, we go through the loop again. In P, 2 plus 1 is equal to 3, so we go on to SWAP and DROP. As with Basic's FOR-NEXT loops, Forth's DO-LOOPs cycle at least once.

This line prints the result of a multiplication: n1 n2 MULTIPLY DUP . The dot is the PRINT command and removes the number on top of the stack and displays it on the screen. DUP keeps a copy of the result for further processing. If only the display was necessary, DUP would be omitted.

In Basic, you might write the routine as follows:

```
100 INPUT A: INPUT B: Y = A:
    Z = B: YY = Y
200 FOR X = Z TO 1 STEP -1
300 YY = YY + Y
400 NEXT X
500 PRINT YY
```

DO-LOOPs are like FOR X = Y TO Z STEP + 1: NEXT X loops.

	Z	Y	OVER	O	=	IF	DUP	ROT	I	DO	OVER	+	LOOP	SWAP	DROP
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
X	Z	Y	Z	O	+1	Y	Y	Z	1	Y	Y	YY	(NOTE1)	Y	YY
	X	Z	Y	Z	Y	Z	Y	Y	Z	Y	Y	Y		YY	X
		X	Z	Y	Z	X	Z	Y	Y	X	Y	X		X	
			X	Z	X		X	X	Y		X				
				X					X						

NOTE1: increment index (loop counter) and compare it to the loop limit.

Figure 3. Graph of MULTIPLY function

3	4	OVER	O	=	IF	DUP	ROT	1	DO	OVER	+	LOOP	OVER	+	LOOP	SWAP	DROP
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
3	4	3	D	+1	4	4	3	1	4	4	8	1+1=3	4	12	2+1=3	4	12
X	3	4	3	4	3	4	4	3	4	4	4		8	4		12	X
	X	3	4	3	X	3	4	4	X	4	X		4	X		X	
		X	3	X		X	X	4		X			X				
			X					X									

NOTE: Columns M and P display the RETURN stack operations.

Figure 4. Multiplication with real numbers

```
[program name]
: TASK ;
declare variables & constants
: MULTIPLY OVER 0 = IF DUP ROT 1 DO OVER + LOOP SWAP DROP
        ELSE DROP DROP 0 ENDIF ;
: SUBONE (process or declaration) ;
: SUBTWO (process or deckaration) ;
: SUBTHR (process or declaration) ;
: SUBFOU SUBONE SUBTWO MULTIPLY ;
: SUBFIV SUBONE SUBTHR MULTIPLY ;
: JOB1 (process) ;
: JOB2 (process ;
: SUBMASTER SUBFIV 1 = IF JOB1 ELSE JOB2 ENDIF ;
: MASTER SUBFOU 1 = IF BEGIN SUBMASTER 1 = UNTIL ENDIF ;
MASTER FORGET TASK
```

Figure 5. Single word defined by a program

In Basic, variables are declared as needed and programs tend to become variable-heavy. MULTIPLY uses no named variables—just stack operations. It's easier to talk about variable-oriented programs. X is equal to this, Y to that. But it's easier to interactively verify stack processing. However, a variable could be assigned, the result of calling MULTIPLY or any of its intermediate steps.

Forth program structure is similar to Pascal. Variables and constants are declared first, followed by definitions of subroutines that do specific tasks for other procedures in the program. Then, step-by-step, the subroutines are used to define more general program routines.

APL and Basic programmers play a game with themselves: writing a complete program in a single line. Forth programmers define, refine and extend the language itself, until a single word is defined by a whole program, as shown in figure 5.

This is a fairly complex example of a Forth program structure, compressed into a single page to avoid losing its shape in minute details. The whole page is the program named MASTER. It can be run by entering MASTER from the keyboard, or by including it on the screen with the program loading the program calls and runs itself. An example is to enter RUN "MASTER" rather than LOAD "MASTER" in Basic.

The definition of the control routine is read like this: if the result of SUBFOU equals 1, do SUBMASTER until SUBMASTER returns a 1. There are two non-system words in MASTER's definition: SUBFOU and SUBMASTER.

SUBFOU is SUBONE multiplied by SUBTWO. SUBFIV is similar, with SUBTHR replacing SUBTWO. The definition of SUBMASTER is, "if SUBFIV equals 1, do JOB1, otherwise do JOB2."

Neither SUBFIV nor MULTIPLY appear in the definition of MASTER, but are nonetheless part of its meaning. Just as in a natural language dictionary, words define other words and are in turn defined by words. Recursion is allowed; MASTER can call itself, but beware of infinite loops.

FORGET TASK removes anything back to the most recent previous TASK definition from memory. It is the same as including NEW at the end of a Basic program. It's necessary because Forth compiles programs each run time on top of what is already in memory. Some Forths recognize only the first three letters of a WORD, others, up to 31.

How complex is Forth, in comparison to Basic and other language options? The programming structure, RPN, the stack and other demanding Forth features force a programmer to stay on top of his task. Basic's voracious need for variables as flags to alter a program's flow can lead the user astray.

On one hand, Forth's stack operations reduce the need for most temporary variables. Stack manipulations are Forth's way of setting up local subroutine variables. On the other hand, Forth variables require more attention than Basic variables. It quickly becomes easier to use the stack.

Forth is more interactive than Basic. To test a subroutine in Forth command mode, numbers (or whatever a routine needs) are placed on the stack and the routine is called: Basic variables' background requirement complicates using GOTO and GOSUB in command mode to interactively verify subroutines.

User commands, edit mode functions and program subroutines may be created and tested in command mode because they are compiled directly into the language. Routines developed for programs can also be used in command mode. Forth permits tailoring the language to suit immediate need.

For example, an astrologer might have a routine to make time-of-birth corrections for longitude variations and daylight savings time. In Forth, the routine could be one of many available in command or calculator mode that simply require entering the data and calling the routine in one step—rather than responding to a program's menu or list of questions. In a sense, the astrologer creates a dedicated astrological language, without giving up the general capability of working with Forth, Basic and Fortran. Forth allows many dedicated calculators to coexist along with it in a computer.

Some implementations of Forth include the capability of producing ROMable code. Small calculators use the same kind of processing chips our computers use and are relatively inexpensive. It seems that there should be a way to combine Forth's ease of programming with small calculators. ROMs, PROMs or EPROMs could interface with Forth programs to create dedicated machines. The market for a calculator dedicated to that task would probably be too small to be commercially successful. But a ROMable calculator with some RAM moves the idea from hardware to software, from the technician to the programmer who can tailor general solutions to special needs and still yield a profit.

The various Basic dialects are more or less mutually translatable. More importantly, within a dialect, the words are constant; a program in Radio Shack level II Basic will work in any TRS-80 model I. As a Forth environment becomes a private creation, it becomes less sharable;

you can't read my program and know what it does if it contains undefined, non-standard WORDS.

While core dictionary symbols—though cryptic—are standardized, personal extensions won't be. That's not only due to programming variations. Correspondingly, use of Disk Basic commands without TRSDOS, a call to a personal Forth command won't work in an environment in which it is not contained.

If you buy a Forth program, consider the changes time will inevitably require. After two years and beyond, who will sleuth the structure of someone else's personal Forth for you?

What of the crytic nature of the language? Just about every alphanumeric keyboard character may be defined as a command word in the dictionary. While Basic and Pascal programs and statements provide clues to their purpose and process—even to the uninitiated—Forth may emerge well-camouflaged.

Nevertheless, once learned, Forth is an easy language to work with, and it runs quickly. How quickly? We wrote a Basic program to display all of the legal Scrabble hands. Uninterrupted, it ran for eight days and was still not finished when we turned it off. Running the same algorithm, our first Forth program completed the task in about three hours, and required a few hours to program. A version in Radio Shack's Tiny Pascal ran about the same length of time but took several days to program.

Forth is an easy language to work with, and it runs quickly

Each program ran on the same unmodified TRS-80.

How easy is Forth to write? From concept to notes to working definition to writing and debugging MULTIPLY usually take less than five minutes, including disk swap.

Forth works well as a personal learning environment. For example, writing a Pascal interpreter in Basic is an interesting exercise but not necessarily useful. A Pascal interpreter in Forth could be fast and complete. With an appropriate grammar, individual versions of any language can be written.

Forth is a unique blend of high level techniques and machine code attention to detail. It's a programming bridge. For personal programs, for self-contained programs like games, and for programs making evaluations from keyboard-entered data like interest tables, Forth is ideal.

Running Forth programs mandates the purchase of a Forth operating system or the assembly of one by another means. Be wary of letting someone else structure files for important business data in Forth. It uses a 1024-byte screen instead of CP/M's 128 or TRSDOS 256-byte buffers. If your programmer uses Forth, get clear documents delineating system extensions as well as program routines and file structure. Access to Forth files can be written in the other languages, and that may be an important provision. □

Don't Let Interest Rates Dazzle You

Continued from page 101

Program listing

```
1 'INITIALIZE.
10 CLEAR 128
20 DEFINT A,D,I,J,L,N,S,W
30 DEFSTR C,H,T
40 DIM A(6),P(7),TI(3),V(7),VA(7)    'VA = VAriable value
41 'DISPLAY PROGRAM INSTRUCTIONS TO USER.
50 K = 0            'K = location Key
60 GOSUB 130
61 'OBTAIN AND RESPOND TO USER COMMANDS.
70 GOSUB 300
80 ON K GOTO 90,2550,60,120
81 'DEFINE LOAN ANALYSIS PROBLEM.
90 GOSUB 370
91 'ANALYZE LOAN AND DISPLAY FINDINGS.
100 GOSUB 1550
101 'WRAP-UP PROGRAM.
110 GOTO 70
120 CLS: END
122 'DISPLAY INSTRUCTIONS.
130 CLS
140 PRINT @ 128,"THIS PROGRAM CALCULATES MONTHLY LOAN PAYMEN
TS FOR"
150 PRINT @ 192,"VARIATIONS IN TOTAL COST, DOWN PAYMENT, ANN
UAL INTEREST RATE,"
160 PRINT @ 256,"OR LOAN PERIOD (YOUR CHOICE).  DATA ENTRY I
NSTRUCTIONS ARE"
570 NEXT I
580 FOR I = 17 TO 39
590 SET(14,I): SET(15,I)
600 NEXT I
603 'SELECT VARIABLE PARAMETER.
610 ST = 322
620 W = 5
630 I = -1
640 I = I + 1
650 SG = ST + 128*I
660 GOSUB 790
670 GOSUB 820
680 GOSUB 870
690 IF CH <> "" THEN GOTO 720
700 GOSUB 820
710 IF CH = "" THEN GOTO 660
720 IF CH = CHR$(13) THEN IF I < 3 THEN GOTO 640: ELSE GOTO
660
730 IF CH = "X" THEN GOTO 760
740 IF CH = CHR$(91) THEN IF I > 0 THEN I = I - 1: GOTO 650
750 GOTO 660
760 PRINT @ SG+66,"X";
770 N = I           'N = Number
780 RETURN
784 'WHITEN BORDER OF BOX.
790 A(0)=188: A(1)=188: A(2)=188: A(3)=191: A(4)=143: A(5)=1
43: A(6)=143
800 GOSUB 250
810 RETURN
814 'DELAY, CHECKING FOR KEYED INPUT.
820 FOR J = 1 TO 50          'J = indexing variable
830 CH = INKEY$
840 IF CH <> "" THEN GOTO 860
850 NEXT J
860 RETURN
864 'DARKEN BORDER OF BOX.
870 A(0)=140: A(1)=140: A(2)=140: A(3)=128: A(4)=140: A(5)=1
40: A(6)=140
880 GOSUB 250
890 RETURN
893 'DISPLAY INSTRUCTIONS FOR CHANGING PARAMETER VALUES.
900 PRINT @ 65,"REVISE THE VALUE IN THE FLASHING BOX, IF DES
IRED."
910 PRINT @ 130,"(PRESS 'ENTER' TO END ENTRY & GET TO NEXT B
OX; '";CHR$(91);"' TO BACK UP."
920 PRINT @ 195,"PRESS 'X' TO END REVISIONS.)";CHR$(30)
930 PRINT @ 294,"CURRENT VALUE";
933 'DISPLAY CURRENT PARAMETER VALUES.
940 SG = 230
950 W = 13
960 A(0)=188: A(1)=140: A(2)=188: A(3)=191: A(4)=143: A(5)=1
40: A(6)=143
970 FOR I = 0 TO 3
980 SG = SG + 128
```

```
170 PRINT @ 320,"PRESENTED WHEN NEEDED."
180 PRINT @ 448,"AFTER ANALYSIS RESULTS ARE DISPLAYED, PRESS
:"
190 PRINT @ 526,"'A' -- TO PERFORM ANOTHER ANALYSIS,"
200 PRINT @ 590,"'Q' -- TO QUIT,"
210 PRINT @ 654,"'X' -- TO EXPAND THE GRAPHIC SCALE, OR"
220 PRINT @ 718,"'I' -- TO REPEAT THESE INSTRUCTIONS."
230 IF K = 0 THEN SG = 845: W = 38: A(0) = 188: A(1) = 140:
A(2) = 188: A(3) = 191: A(4) = 143: A(5) = 140: A(6) = 143:
GOSUB 250: PRINT @ 912,"PRESS 'A' TO PROCEED; 'Q' TO QUIT.";
240 RETURN
243 'DRAW BOX.
250 PRINT @ SG,CHR$(A(0));STRING$(W-2,A(1));CHR$(A(2));
260 PRINT @ SG+64,CHR$(A(3));: PRINT @ SG+W+63,CHR$(A(3));
270 PRINT @ SG+128,CHR$(A(4));STRING$(W-2,A(5));CHR$(A(6));
280 IF A(0) = 188 AND A(1) = 140 THEN A(0) = 191: A(2) = 191
290 RETURN
292 'OBTAIN AND INTERPRET USER'S INSTRUCTION.
300 CH = INKEY$              'CH = CHaracter
310 IF CH = "A" OR CH = "X" OR CH = "I" OR CH = "Q" THEN GOT
O 320 ELSE GOTO 300
320 IF CH = "A" THEN K = 1: GOTO 360
330 IF CH = "X" THEN IF K <> 0 THEN K = 2: GOTO 360: ELSE GO
TO 300
340 IF CH = "I" THEN K = 3: GOTO 360
350 K = 4
360 RETURN
362 'SELECT ITEM TO BE VARIED.
370 GOSUB 410
372 'SET FIXED PARAMETER VALUES.
380 GOSUB 900
382 'SET INCREMENT SIZE FOR VARIABLE.
390 GOSUB 1260
400 RETURN
403 'DISPLAY SELECTION INSTRUCTIONS.
410 CLS
420 PRINT @ 65,"WHICH OF THE FOLLOWING DO YOU WANT TO VARY?"
430 PRINT @ 130,"(SELECT ONE BY PLACING AN 'X' IN ITS BOX."
440 PRINT @ 195,"PRESS 'ENTER' TO GET TO NEXT BOX; '";CHR$(9
1);"' TO BACK UP.)"
443 'DISPLAY VARIABLES FOR SELECTION.
450 TI(0) = "TOTAL COST ($)"          'TI = TItle
460 TI(1) = "DOWN PAYMENT ($)"
470 TI(2) = "ANNUAL INTEREST RATE (%)"
480 TI(3) = "PAYBACK PERIOD (YEARS)"
490 SG = 193              'SG = Start Graphics
500 W = 38                'W = Width
510 A(0)=188: A(1)=140: A(2)=188: A(3)=191: A(4)=143: A(5)=1
40: A(6)=143
520 FOR I = 0 TO 3            'I = Indexing variable
530 SG = SG + 128
540 ST = SG + 74              'ST = Start Text (or numbers)
550 PRINT @ ST,TI(I)
560 GOSUB 250
990 VL$ = STR$(V(I))              'VL$ = VaLue
1000 VL$ = RIGHT$(VL$,LEN(VL$)-1)
1010 ST = SG + 70 - (LEN(VL$)/2)
1020 PRINT @ ST-1," ";VL$;
1030 GOSUB 250
1040 NEXT I
1043 'CHANGE INITIAL PARAMETER VALUES, AS DESIRED.
1050 W = 11
1060 I = -1
1070 I = I + 1
1080 SG = 359 + 128*I
1090 ST = SG + 64
1100 NO$ = ""             'NO$ = NO. (number)
1110 CK = " "             'CK = CheCK character
1120 GOSUB 790
1130 GOSUB 820
1140 GOSUB 870
1150 IF CH <> "" THEN GOTO 1180
1160 GOSUB 820
1170 IF CH = "" THEN GOTO 1120
1180 IF CH = CHR$(13) THEN IF I < 3 THEN GOTO 1070: ELSE GOT
O 1100
1190 IF CH = CHR$(91) THEN IF I > 0 THEN I = I - 1: GOTO 108
0: ELSE GOTO 1100
1200 IF ( CH >= "0" AND CH <= "9") OR (CH = "." AND CK <> ".
") THEN NO$ = NO$ + CH: GOSUB 1230
1210 IF CH = "." THEN CK = "."
1220 IF CH = "X" THEN RETURN: ELSE GOTO 1120
1224 'CONVERT, STORE, AND DISPLAY INPUT NUMBERS.
1230 V(I) = VAL(NO$)              'V = Value
1240 PRINT @ ST,STRING$(W," ");: PRINT @ ST+6-(LEN(NO$)/2),N
O$;
1250 RETURN
1253 'DISPLAY INSTRUCTIONS FOR RESETTING INCREMENT.
1260 PRINT @ 65,"REVISE THE INCREMENT IN THE FLASHING BOX, I
F DESIRED."
1270 PRINT @ 130,"PRESS 'ENTER' TO END ENTRY; 'X' TO END REV
ISION.";CHR$(30);
1280 PRINT @ 195,CHR$(30);: PRINT @ 294,STRING$(13," ");: PR
INT @ 308,"INCREMENT";
1283 'DISPLAY CURRENT INCREMENT VALUE.
1290 I = N + 4
1300 SG = 370 + 128*N
1310 W = 13
1320 A(2) = 188: A(3) = 191: A(6) = 143      'A = constAnt
1330 IF N = 0 THEN A(0) = 188 ELSE A(0) = 191
1340 IF N = 3 THEN A(4) = 143 ELSE A(4) = 191
1350 VL$ = STR$(V(I))
1360 VL$ = RIGHT$(VL$,LEN(VL$)-1)
1370 ST = SG + 70 - (LEN(VL$)/2)
1380 PRINT @ ST-1," ";VL$;
1390 GOSUB 250
1393 'CHANGE INCREMENT VALUE, IF DESIRED.
1400 SG = SG + 1
```

```
1410 W = 11
1420 ST = SG + 64
1430 NO$ = ""
1440 CK = " "
1450 GOSUB 790
1460 GOSUB 820
1470 GOSUB 870
1480 IF CH <> "" THEN GOTO 1510
1490 GOSUB 820
1500 IF CH = "" THEN GOTO 1450
1510 IF CH = CHR$(13) THEN GOTO 1430
1520 IF (CH >= "0" AND CH <= "9") OR ( CH = "." AND CK <> ".
") THEN NO$ = NO$ + CH: GOSUB 1230
1530 IF CH = "." THEN CK = "."
1540 IF CH = "X" THEN RETURN: ELSE GOTO 1450
1542 'CALCULATE MONTHLY LOAN PAYMENTS.
1550 GOSUB 1580
1552 'DISPLAY ANALYSIS RESULTS.
1560 GOSUB 1690
1570 RETURN
1573 'SET INITIAL VALUES.
1580 SU! = V(0) - V(1)            'SU! = loan SUm
1590 IR! = V(2)/1200              'IR = annual Interest Rate
1600 NP = 12*V(3)                 'NP = Number of Payments
1603 'CALCULATE PAYMENTS.
1610 FOR I = 0 TO 7
1620 P(I) = SU!*IR!/(1 - (1 + IR!)[(-NP)) + .005
1623 'RESET VARIABLE VALUE; STORE VARIABLE FOR DISPLAY.
1630 IF N = 0 THEN SU! = SU! + V(4): VA(I) = V(0) + (I*V(4))
: GOTO 1670
1640 IF N = 1 THEN SU! = SU! - V(5): VA(I) = V(1) + (I*V(5))
: GOTO 1670
1650 IF N = 2 THEN IR! = IR! + (V(6)/1200): VA(I) = V(2) + (
I*V(6)): GOTO 1670
1660 NP = NP + (12*V(7)): VA(I) = V(3) + (I*V(7))
1670 NEXT I
1680 RETURN
1683 'DISPLAY ANALYSIS CONDITIONS.
1690 CLS
1700 GOSUB 1730
1703 'DISPLAY RESULTS:  NUMBERS AND GRAPHS.
1710 GOSUB 2150
1720 RETURN
1724 'REVISE TITLES.
1730 TI(0) = "COST ($)"
1740 TI(1) = "DOWN ($)"
1750 TI(2) = "RATE (%)"
1760 TI(3) = "TERM (YRS)"
1764 'DISPLAY HEADINGS AND CONDITIONS.
1770 PRINT @ 23,"REPAYMENT SCHEDULE";
1780 IF N > 1 THEN GOTO 1830
1790 H1 = STR$(V(2))              'H1 = Heading #1
1800 H2 = STR$(V(3))              'H2 = Heading #2
1810 HD = RIGHT$(H1,LEN(H1)-1) + "% LOAN FOR " + RIGHT$(H2,L
EN(H2)-1) + " YEARS"              'HD = HeaDing
1820 GOTO 1870
1830 H1 = STR$(V(0) - V(1))
1840 GOSUB 1970
1850 H1 = "$" + H1
1860 IF N = 2 THEN H2 = STR$(V(3)): HD = H1 + " LOAN FOR " +
 RIGHT$(H2,LEN(H2)-1) + " YEARS": ELSE H2 = STR$(V(2)): HD =
 H1 + " LOAN AT " + RIGHT$(H2,LEN(H2)-1) + "% INTEREST"
1870 PRINT @ 96-(LEN(HD)/2),HD;
1880 PRINT @ 143,STRING$(35,CHR$(131));
1890 PRINT @ 192,CHR$(188);STRING$(12,CHR$(140));CHR$(188);S
TRING$(49,CHR$(140));CHR$(188);
1900 PRINT @ 256,CHR$(191);TAB(7-(LEN(TI(N))/2)) TI(N);TAB(1
3) CHR$(191);TAB(29) "MONTHLY PAYMENT ($)";TAB(63) CHR$(191)
;
1910 PRINT @ 320,CHR$(191);STRING$(12,CHR$(131));CHR$(191);S
TRING$(49,CHR$(131));CHR$(191);
1920 FOR I = 0 TO 7
1930 PRINT @ 384+64*I,CHR$(191);TAB(13) CHR$(191);TAB(63) CH
R$(191);
1940 NEXT I
1950 PRINT @ 896, CHR$(143);STRING$(12,CHR$(140));CHR$(143);
STRING$(49,CHR$(140));CHR$(143);
1960 RETURN
1965 'REMOVE LEADING BLANK AND INSERT COMMAS.
1970 L1 = LEN(H1) - 1             'L1 = Length #1
1980 H1 = RIGHT$(H1,L1)
1990 LC = 0                       'LC = LoCation
2000 FOR I = 1 TO L1
2010 IF MID$(H1,I,1) = "." THEN LC = I: GOTO 2030
2020 NEXT I
2030 IF LC = 0 THEN HT = "" ELSE HT = RIGHT$(H1,L1-LC+1): H1
 = LEFT$(H1,LC-1): L1 = LC - 1
2040 IF L1 < 4 THEN HT = H1 + HT: GOTO 2130
2050 ND = (L1 - 1)/3 + 1          'ND = eND
2060 FOR I = 1 TO ND
2070 HT = RIGHT$(H1,3) + HT       'HT = Heading (Temporary)
2080 L1 = L1 - 3
2090 IF L1 < 0 THEN L1 = 0
2100 H1 = LEFT$(H1,L1)
2110 IF I <> ND THEN HT = "," + HT
2120 NEXT I
2130 H1 = HT
2140 RETURN
2144 'DETERMINE EXTREME PAYMENT RANGE.
2150 MX = 0                 'MX = MaXimum value
2160 FOR I = 0 TO 7
2170 IF P(I) > MX THEN MX = P(I)     'P = monthly Payment
2180 NEXT I
2190 MN = MX                'MN = MiNimum value
2200 FOR I = 0 TO 7
2210 IF P(I) < MN THEN MN = P(I)
2220 NEXT I
```

```
2224 'SET NO. DECIMAL PLACES IN INDEPENDENT VARIABLE.
2230 CS = STR$(V(N+4))          'CS = Character String
2240 LC = 0
2250 FOR I = 1 TO LEN(CS)
2260 IF MID$(CS,I,1) = "." THEN LC = I: GOTO 2280
2270 NEXT I
2280 IF LC = 0 THEN DP = 0 ELSE DP = LEN(CS) - LC
2284 'DISPLAY BAR CHART AND AMOUNTS.
2290 FOR J = 0 TO 7
2300 W2 = 72*(P(J)/MX) + .5          'W2 = Width #2
2310 W1 = W2/2                       'W1 = Width #1
2320 IF CSNG(2*W1) = W2 THEN NC = 149 ELSE NC = 174
2330 ST = 390 + (64*J)
2340 H1 = STR$(V(N) + (J*V(N+4)))
2350 GOSUB 2490
2360 IF DC <> DP THEN IF DC > DP THEN H1 = LEFT$(H1,LEN(H1)-(D
     (DC-DP)) ELSE IF DC = 0 THEN H1 = H1 + "." + STRING$(DP,"0")
      ELSE H1 = H1 + STRING$(DP-DC,"0")   'DP = no. of Decimal Pla
     ces
2370 GOSUB 1970                      'HV = Heading Value
2380 HV = H1
2390 H1 = STR$(P(J))
2400 GOSUB 2490
2410 IF DC <> 2 THEN IF DC > 2 THEN H1 = LEFT$(H1,LEN(H1)-(D
     C-2)) ELSE H1 = H1 + STRING$(2-DC,"0")   'DC = Decimal Count
2420 GOSUB 1970
2430 PRINT @ ST-5,STRING$(12," ");
2440 PRINT @ ST+8,STRING$(49," ");
2450 PRINT @ ST-(LEN(HV)/2),HV;
2460 PRINT @ ST+8,STRING$(W1,CHR$(140));CHR$(NC);" ";H1;
2470 NEXT J
2480 RETURN
2485 'COUNT NUMBER OF DECIMAL PLACES IN DISPLAYED NUMBERS.
2490 LC = 0
2500 FOR L = 1 TO LEN(H1)                'L = indexing variable
2510 IF MID$(H1,L,1) = "." THEN LC = L: GOTO 2530
2520 NEXT L
2530 IF LC = 0 THEN DC = 0 ELSE DC = LEN(H1) - LC
2540 RETURN
2541 'EXPAND GRAPHIC PORTION OF DISPLAY.
2550 FOR J = 0 TO 7
2560 W2 = 72*((P(J) - MN)/(MX - MN)) + .5
2570 W1 = W2/2
2580 IF CSNG(2*W1) = W2 THEN NC = 149 ELSE NC = 174
2590 ST = 398 + (64*J)
2600 H1 = STR$(P(J))
2610 GOSUB 2490
2620 IF DC <> 2 THEN H1 = LEFT$(H1,LEN(H1)-(D
     C-2)) ELSE H1 = H1 + STRING$(2-DC,"0")
2630 GOSUB 1970
2640 PRINT @ ST,STRING$(49," ");
2650 PRINT @ ST,STRING$(W1,CHR$(140));CHR$(NC);" ";H1;
2660 NEXT J
2670 GOTO 70
```

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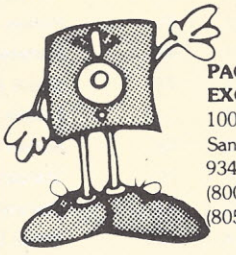

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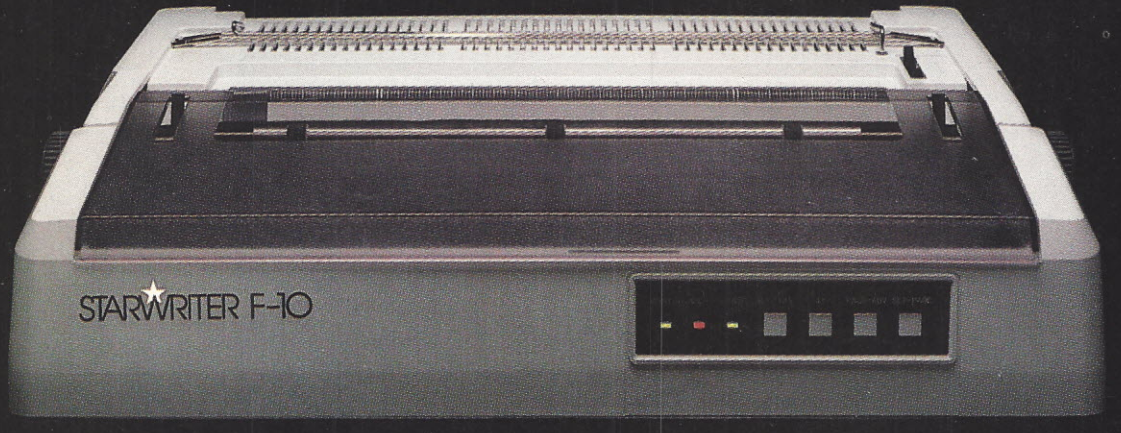

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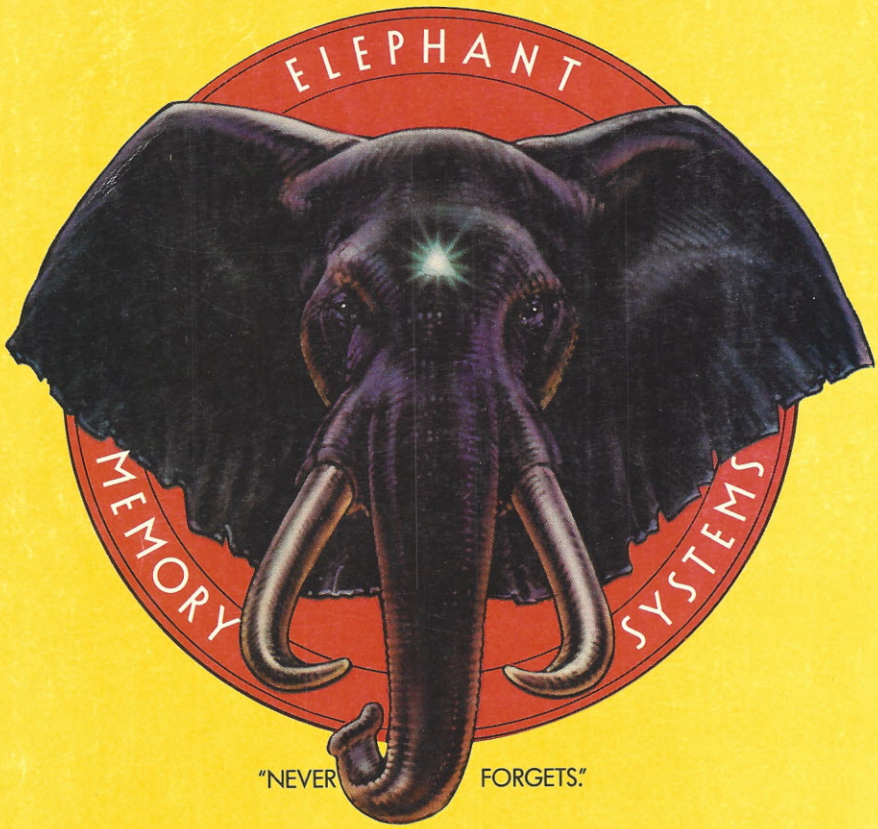

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